T20

The Unified Medical Language System (UMLS): What Is It and How to Use It?

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U.S. National Library of Medicine

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The Unified Medical Language System
What is it and how to use it?

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Outline

- What is the UMLS?
- How to use the UMLS?
  - Obtaining a license
  - Remote access
    - Knowledge Source Server (UMLSKS)
    - UMLSKS Application programming interface (API)
  - Local installation and customization (MetamorphoSys)
- Questions

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Part I
What is the UMLS?

Outline

- Part I: *What is the UMLS?*
  - Introduction
  - Overview through an example
  - The three UMLS Knowledge Sources
    - UMLS Metathesaurus
    - UMLS Semantic Network
    - SPECIALIST Lexicon and lexical tools

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Part I
What is the UMLS?

(1) Introduction

What does UMLS stand for?

- Unified
- Medical
- Language
- System

UMLS®
Unified Medical Language System®
UMLS Metathesaurus®

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Motivation

[Lindberg & al., *Methods*, 1993]
[Humphreys & al., *JAMIA*, 1998]

- Started in 1986
- National Library of Medicine
- "Long-term R&D project"
- Complementary to IAIMS (Integrated Academic Information Management Systems)

«[…] the UMLS project is an effort to overcome two significant barriers to effective retrieval of machine-readable information.

- The first is the variety of ways the same concepts are expressed in different machine-readable sources and by different people.
- The second is the distribution of useful information among many disparate databases and systems.»

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The UMLS in practice

- Database
  - Series of relational files
- Interfaces
  - Web interface: Knowledge Source Server (UMLSKS)
  - Application programming interfaces (Java and XML-based)
- Applications
  - lvg (lexical programs)
  - MetamorphoSys (installation and customization)

The UMLS is *not* an end-user application

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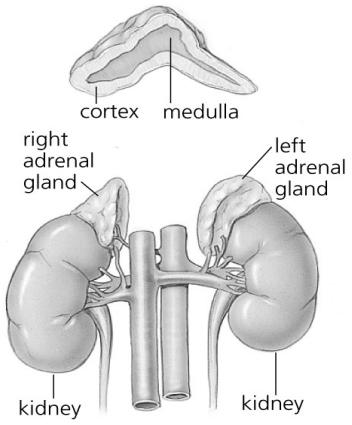
Part I
What is the UMLS?

(2) Overview through an example

Addison's disease

- Addison's disease is a rare endocrine disorder
- Addison's disease occurs when the adrenal glands do not produce enough of the hormone cortisol
- For this reason, the disease is sometimes called chronic adrenal insufficiency, or hypocortisolism



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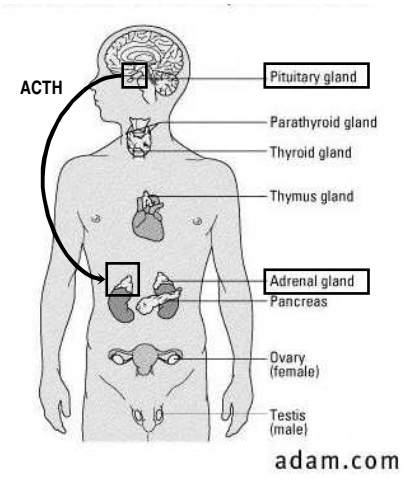
Adrenal insufficiency Clinical variants

- Primary / Secondary
  - Primary: lesion of the adrenal glands themselves
  - Secondary: inadequate secretion of ACTH by the pituitary gland
- Acute / Chronic
- Isolated / Polyendocrine deficiency syndrome



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Addison's disease: Symptoms

- Fatigue
- Weakness
- Low blood pressure
- Pigmentation of the skin (exposed and non-exposed parts of the body)
- …

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AD in medical vocabularies

- Synonyms: different terms
  - Addisonian syndrome — eponym
  - Bronzed disease — symptoms
  - Addison melanoderma — symptoms
  - Asthenia pigmentosa — symptoms
  - Primary adrenal deficiency — clinical variants
  - Primary adrenal insufficiency — clinical variants
  - Primary adrenocortical insufficiency — clinical variants
  - Chronic adrenocortical insufficiency — clinical variants
- Contexts: different hierarchies

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Organize terms

- Synonymous terms clustered into a concept
- Preferred term
- Unique identifier (CUI)

Adrenal gland diseases	MeSH	D000307
Adrenal disorder	AOD	0000005418
Disorder of adrenal gland	Read	C15z.
Diseases of the adrenal glands	SNOMED	DB-70000

C0001621

Adrenal Gland Diseases

NLM

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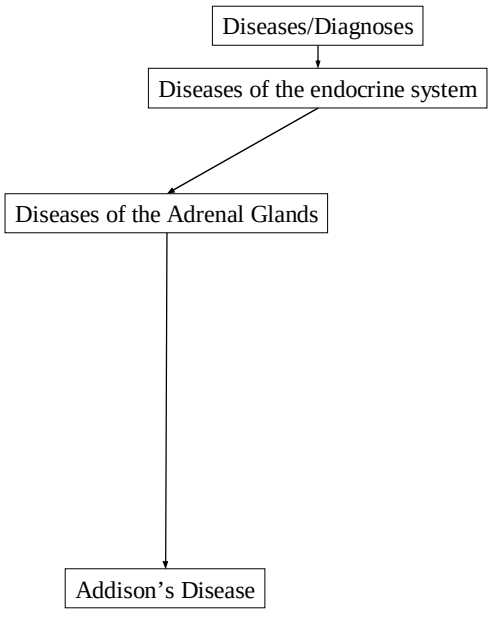
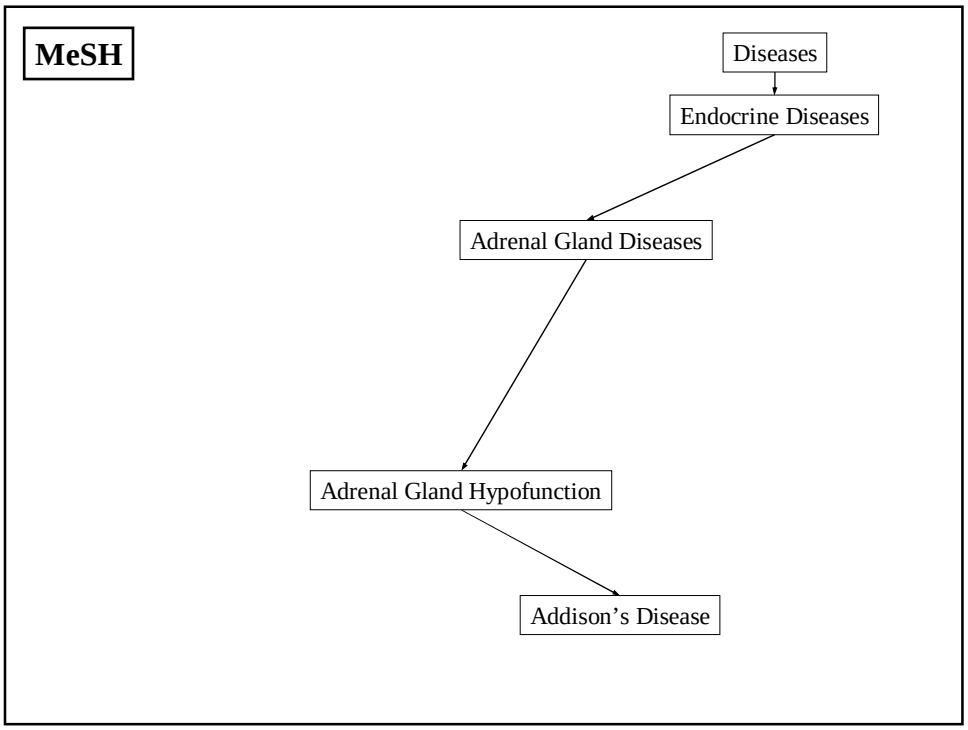
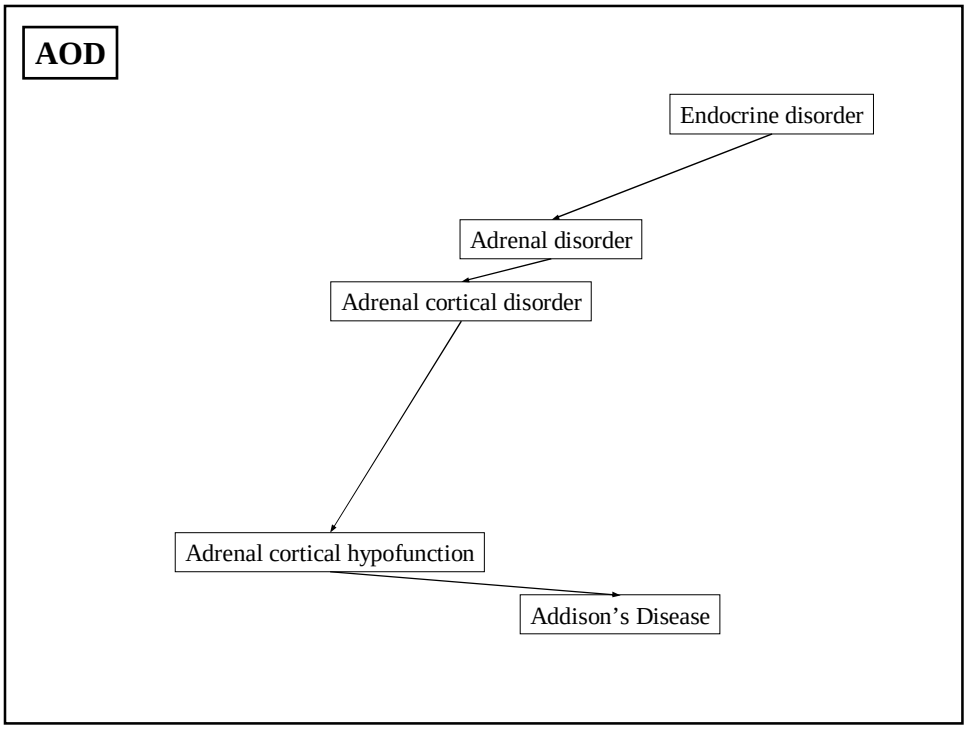
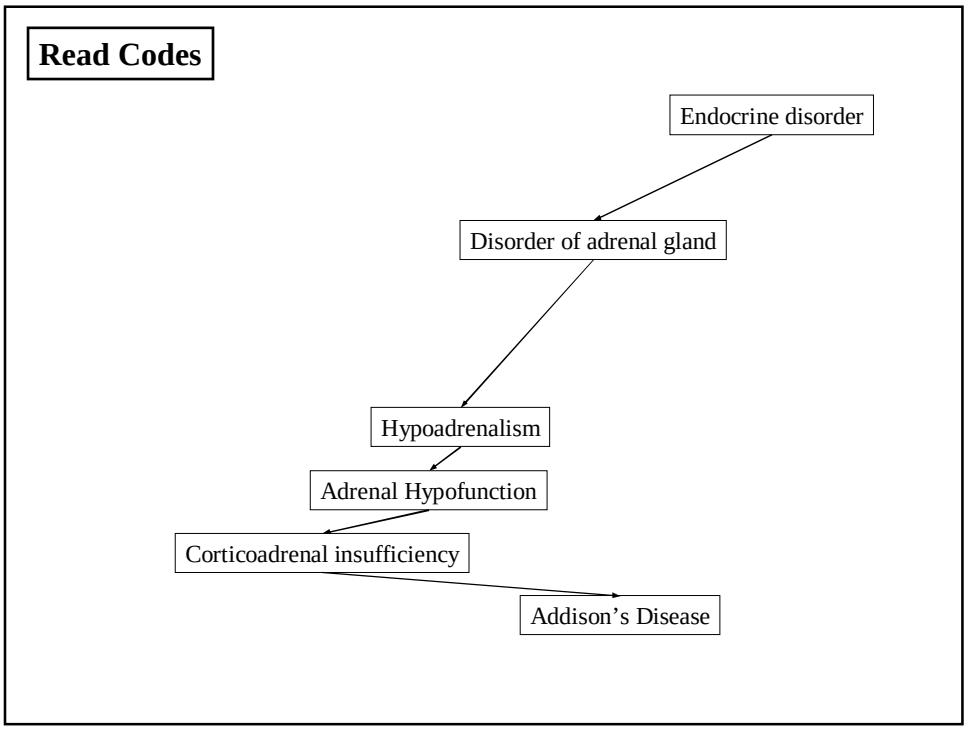
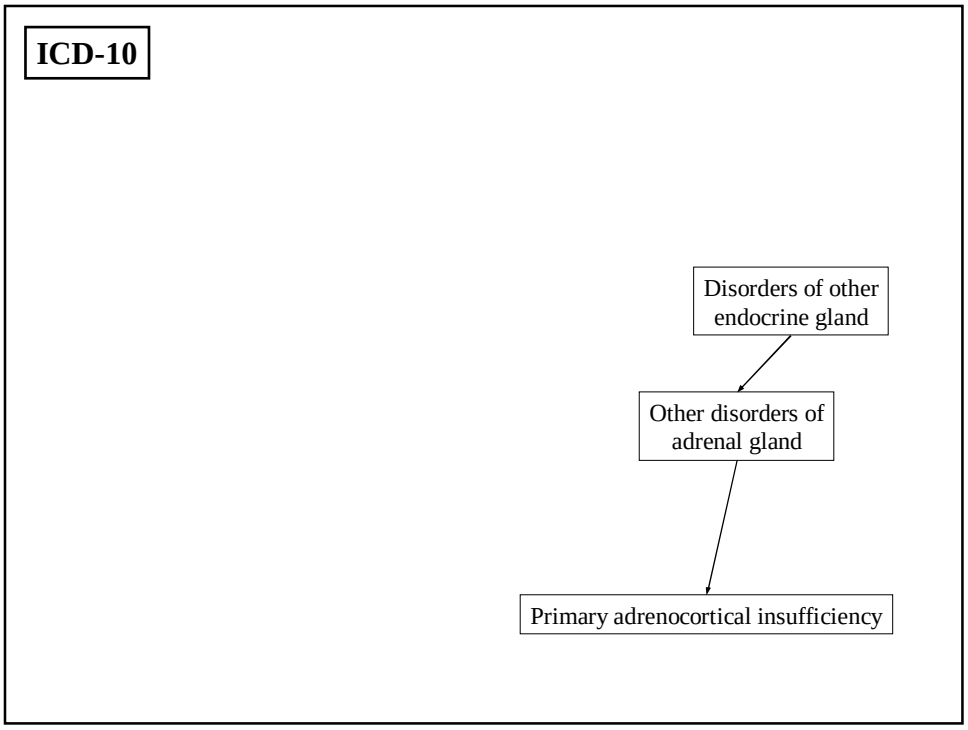
SNOMED International




MeSH
Diseases
Endocrine Diseases
Adrenal Gland Diseases
Adrenal Gland Hypofunction
Addison's Disease

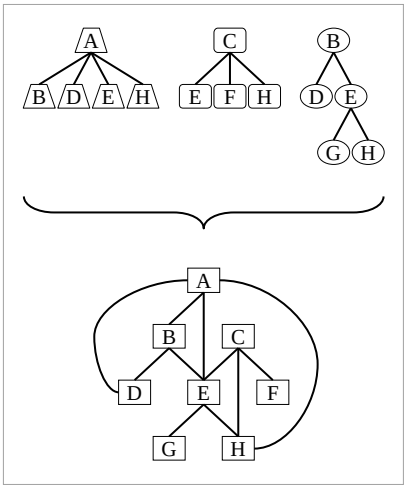

AOD
Endocrine disorder
Adrenal disorder
Adrenal cortical disorder
Adrenal cortical hypofunction
Addison's Disease


Read Codes
Endocrine disorder
Disorder of adrenal gland
Hypoadrenalism
Adrenal Hypofunction
Corticoadrenal insufficiency
Addison's Disease


ICD-10
Disorders of other endocrine gland
Other disorders of adrenal gland
Primary adrenocortical insufficiency

Organize concepts

- Inter-concept relationships: hierarchies from the source vocabularies
- Redundancy: multiple paths
- One graph instead of multiple trees (multiple inheritance)



NLM

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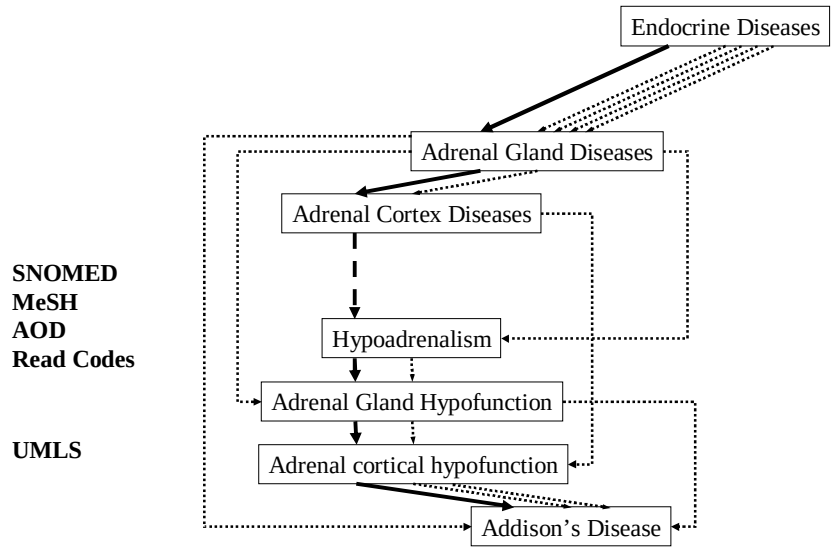
organize concepts



Relate to other concepts

- Additional hierarchical relationships
  - link to other trees
  - make relationships explicit
- Non-hierarchical relationships
- Co-occurring concepts
- Mapping relationships

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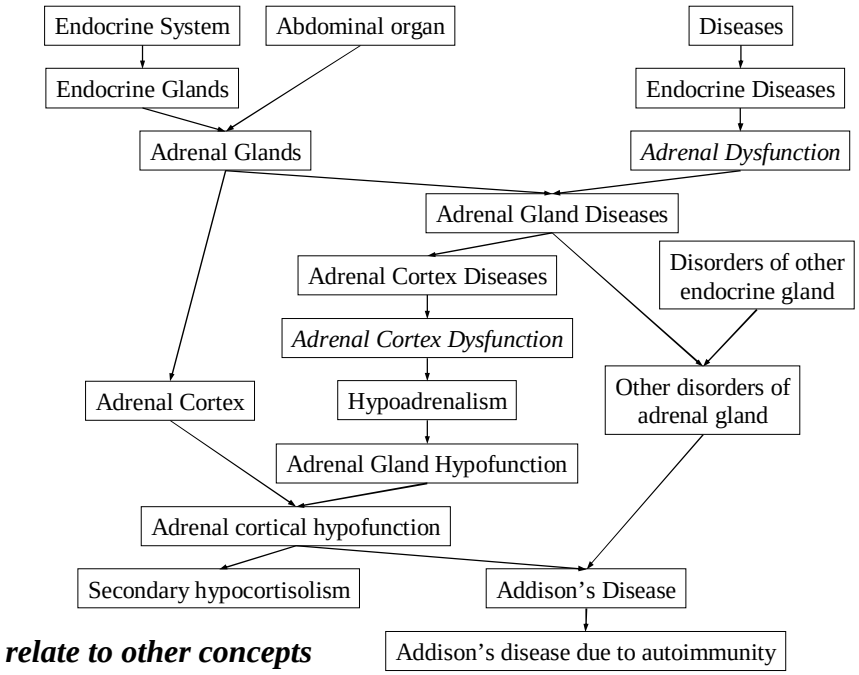
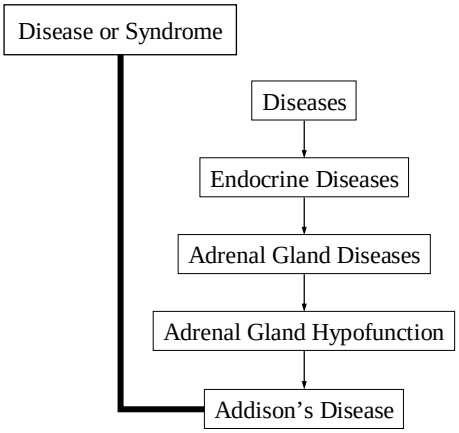


relate to other concepts

Categorize concepts

- High-level categories (semantic types)
- Assigned by the Metathesaurus editors
- Independently of the hierarchies in which these concepts are located



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How do they do that?

- Lexical knowledge
- Semantic pre-processing
- UMLS editors

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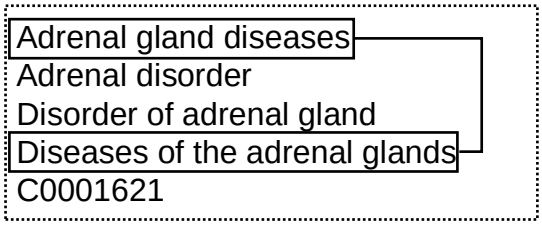
Lexical knowledge



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Semantic pre-processing

- Metadata in the source vocabularies
- Tentative categorization
- Positive (or negative) evidence for tentative synonymy relations based on lexical features

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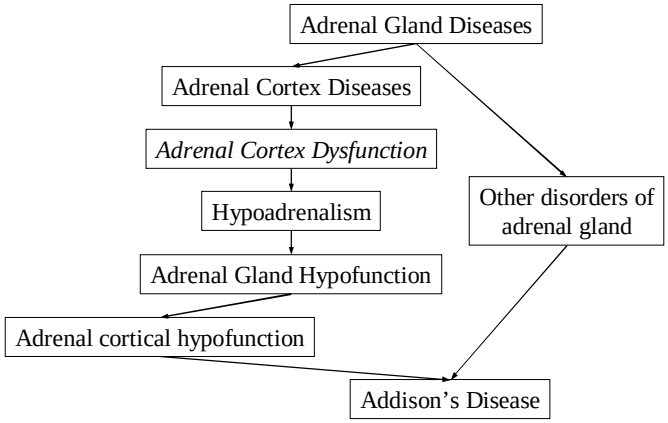
Additional knowledge: UMLS editors



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UMLS Summary

- Synonymous terms clustered into concepts
- Unique identifier

- Finer granularity
- Broader scope
- Additional hierarchical relationships
- Semantic categorization

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Part I
What is the UMLS?

(3) UMLS Knowledge Sources

UMLS 3 components

- Metathesaurus
  - Concepts
  - Inter-concept relationships
- Semantic Network
  - Semantic types
  - Semantic network relationships
- Lexical resources
  - SPECIALIST Lexicon
  - Lexical tools

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UMLS Metathesaurus

Metathesaurus Basic organization

- Concepts
  - Synonymous terms are clustered into a concept
  - Properties are attached to concepts, e.g.,
    - Unique identifier
    - Definition
- Relations
  - Concepts are related to other concepts
  - Properties are attached to relations, e.g.,
    - Type of relationship
    - Source

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Source Vocabularies (2004AB)

- 134 source vocabularies
  - 126 contributing concept names
- 73 families of vocabularies
  - multiple translations (e.g., MeSH, ICPC, ICD-10)
  - variants (American-English equivalents, Australian extension/adaptation)
  - subsequent editions usually considered distinct families (ICD: 9-10; DSM: IIIR-IV)
- Broad coverage of biomedicine
- Common presentation

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Biomedical terminologies

- General vocabularies
  - anatomy (UWDA, Neuronames)
  - drugs (RxNorm, First DataBank, Micromedex)
  - medical devices (UMD, SPN)
- Several perspectives
  - clinical terms (SNOMED CT)
  - information sciences (MeSH, CRISP)
  - administrative terminologies (ICD-9-CM, CPT-4)
  - data exchange terminologies (HL7, LOINC)

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Biomedical terminologies (cont'd)

- Specialized vocabularies
  - nursing (NIC, NOC, NANDA, Omaha, PCDS)
  - dentistry (CDT)
  - oncology (PDQ)
  - psychiatry (DSM, APA)
  - adverse reactions (COSTART, WHO ART)
  - primary care (ICPC)
- Terminology of knowledge bases (AI/Rheum, DXplain, QMR)

The UMLS serves as a vehicle for the regulatory standards (HIPAA, CHI)

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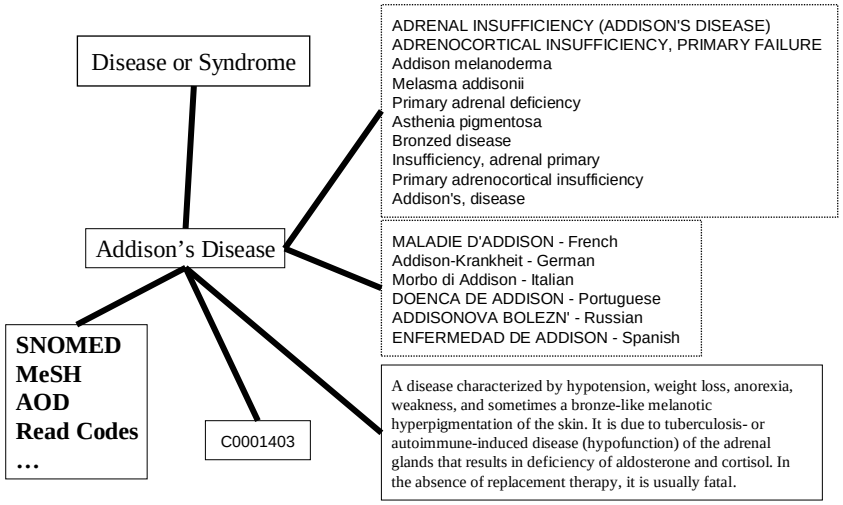
Addison's Disease: Concept



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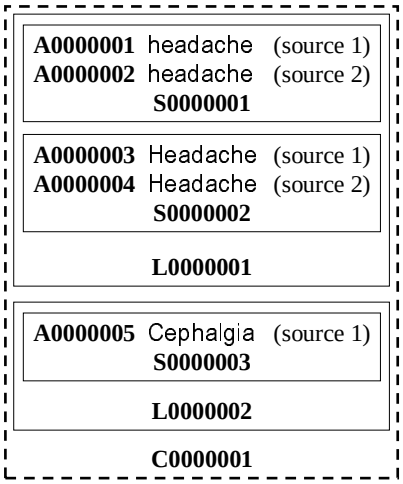
Metathesaurus Concepts (2004AB)

- Concept (> 1M) CUI
  - Set of synonymous concept names
- Term (> 3.8 M) LUI
  - Set of normalized names
- String (> 4.3M) SUI
  - Distinct concept name
- Atom (> 5.1M) AUI
  - Concept name in a given source



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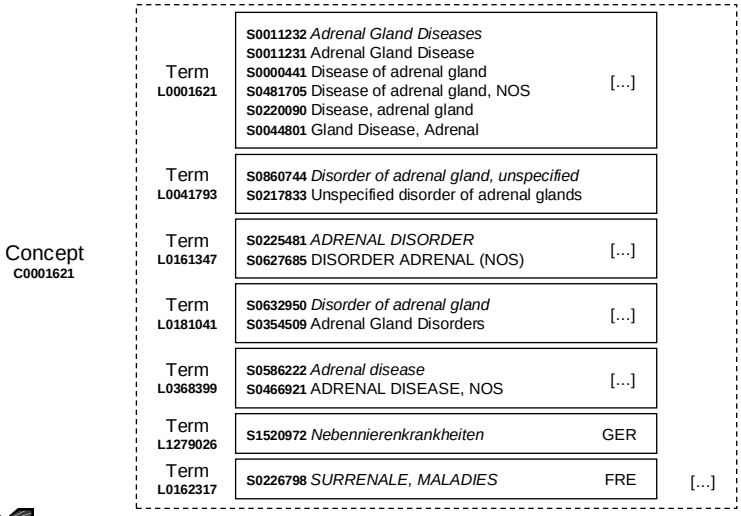
Cluster of synonymous terms



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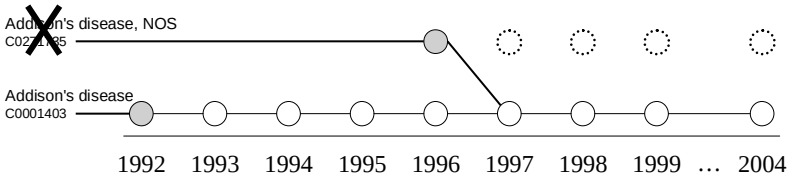
Metathesaurus Evolution over time

- Concepts never die (in principle)
  - CUIs are permanent identifiers
- What happens when they do die (in reality)?
  - Concepts can merge or split
  - Resulting in new concepts and deletions



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Metathesaurus Relationships

- Symbolic relations: ~9 M pairs of concepts
- Statistical relations : ~7 M pairs of concepts (co-occurring concepts)
- Mapping relations: 100,000 pairs of concepts

- Categorization: Relationships between concepts and semantic types from the Semantic Network

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Symbolic relations

- Relation
  - Pair of "atom" identifiers
  - Type
  - Attribute (if any)
  - List of sources (for type and attribute)
- Semantics of the relationship: defined by its type [and attribute]

Source transparency: the information is recorded at the "atom" level

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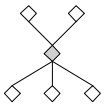
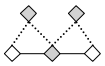
Symbolic relationships Type

- Hierarchical
  - Parent / Child **PAR/CHD**
  - Broader / Narrower than **RB/RN**
- Derived from hierarchies
  - Siblings (children of parents) **SIB**
- Associative
  - Other **RO**
- Various flavors of near-synonymy
  - Similar **RL**
  - Source asserted synonymy **SY**
  - Possible synonymy **RQ**





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Symbolic relationships Attribute

- Hierarchical
  - isa (is-a-kind-of)
  - part-of
- Associative
  - location-of
  - caused-by
  - treats
  - …
- Cross-references (mapping)

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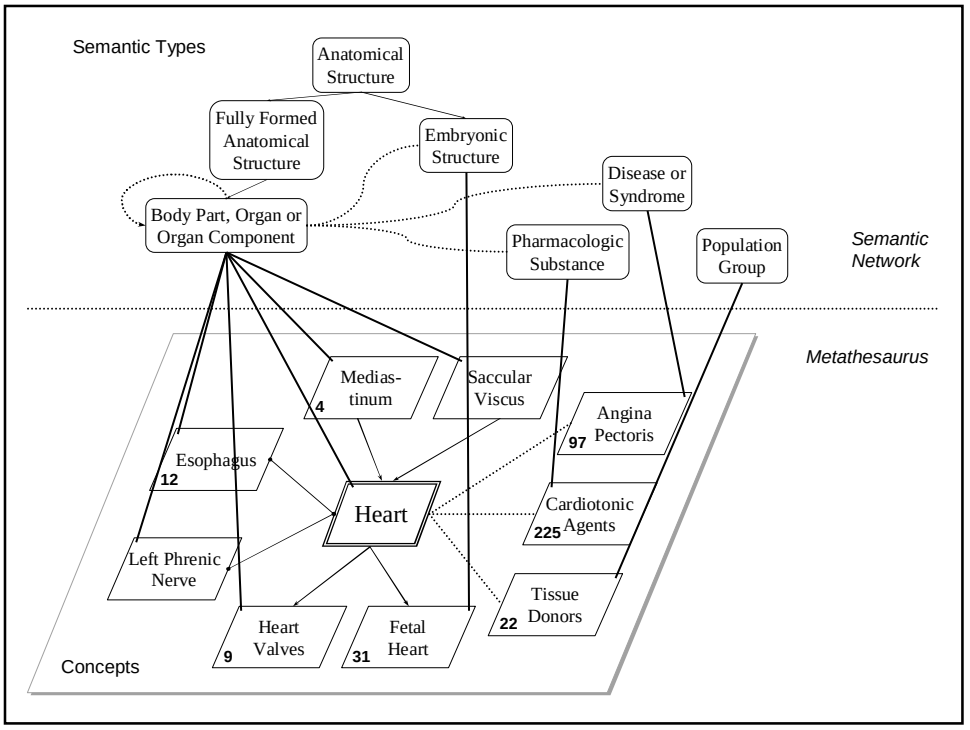

UMLS Semantic Network

Semantic Network

- Semantic types (135)
  - tree structure
  - 2 major hierarchies
    - Entity
      - Physical Object
      - Conceptual Entity
    - Event
      - Activity
      - Phenomenon or Process

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Semantic Network

- Semantic network relationships (54)
  - hierarchical (isa = is a kind of)
    - among types
      - Animal *isa* Organism
      - Enzyme *isa* Biologically Active Substance
    - among relations
      - treats *isa* affects
  - non-hierarchical
    - Sign or Symptom *diagnoses* Pathologic Function
    - Pharmacologic Substance *treats* Pathologic Function

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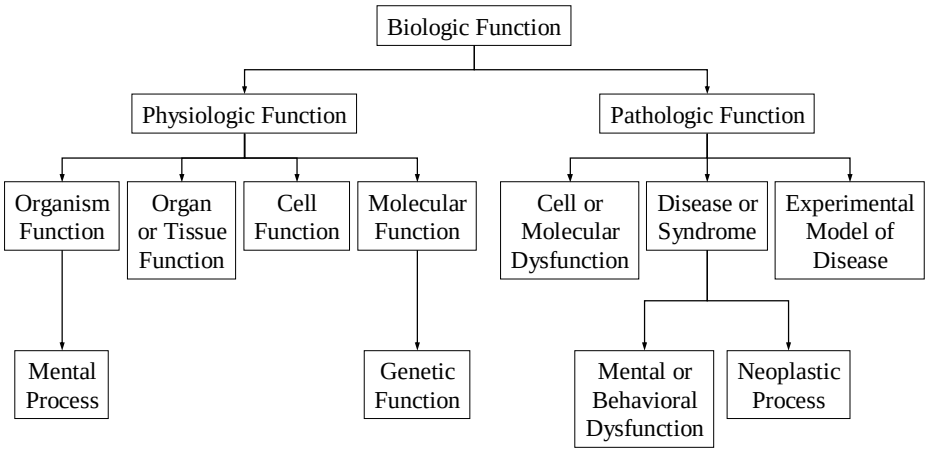
"Biologic Function" hierarchy (isa)



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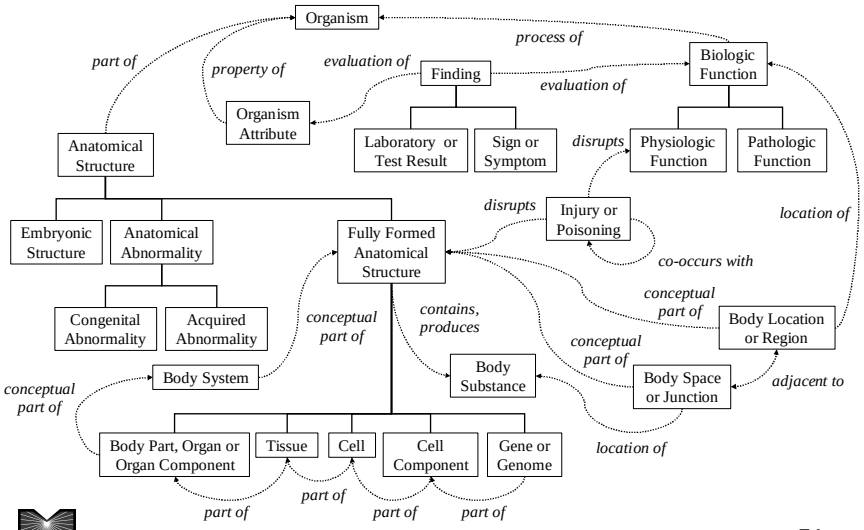
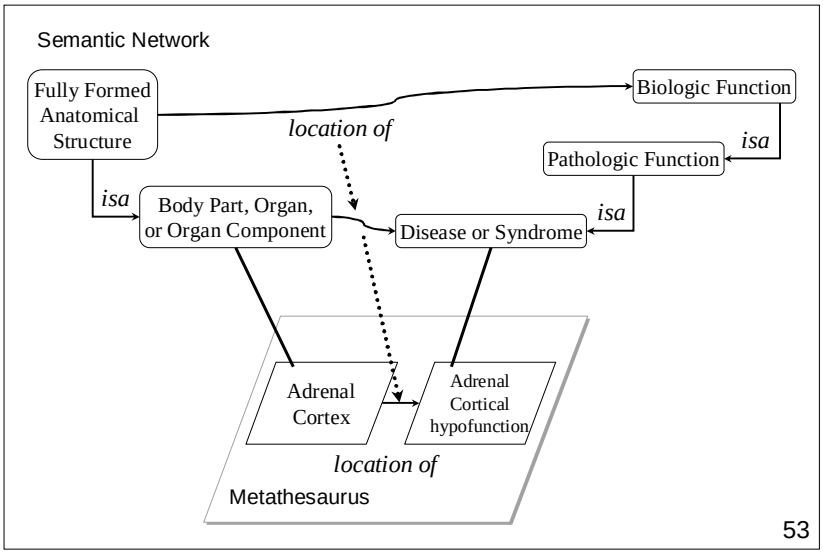
Associative (non-isa) relationships



Why a semantic network?

- Semantic Types serve as high level categories assigned to Metathesaurus concepts, *independently of their position in a hierarchy*
- A relationship between 2 Semantic Types (ST) is a possible link between 2 concepts that have been assigned to those STs
  - The relationship may or may not hold at the concept level
  - Other relationships may apply at the concept level

Relationships can inherit semantics



SPECIALIST Lexicon and lexical tools

SPECIALIST Lexicon

- Content
  - English lexicon
  - Many words from the biomedical domain
- 200,000+ lexical items
- Word properties
  - morphology
  - orthography
  - syntax
- Used by the lexical tools

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Morphology

- Inflection
  - noun nucleus, nuclei
  - verb cauterize, cauterizes, cauterized, cauterizing
  - adjective red, redder, reddest
- Derivation
  - verb ⟺ noun cauterize -- cauterization
  - adjective ⟺ noun red -- redness

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Orthography

- Spelling variants
  - oe/e — oesophagus - esophagus
  - ae/e — anaemia - anemia
  - ise/ize — cauterise - cauterize
  - genitive mark — Addison's disease
Addison disease
Addisons disease

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Syntax

- Complementation
  - verbs
    - intransitive — I'll treat.
    - transitive — He treated the patient.
    - ditransitive — He treated the patient with a drug.
  - nouns
    - prepositional phrase

      Valve of coronary sinus
- Position for adjectives

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Lexical tools

- To manage lexical variation in biomedical terminologies
- Major tools
  - Normalization
  - Indexes
  - Lexical Variant Generation program (lvg)
- Based on the SPECIALIST Lexicon
- Used by noun phrase extractors, search engines

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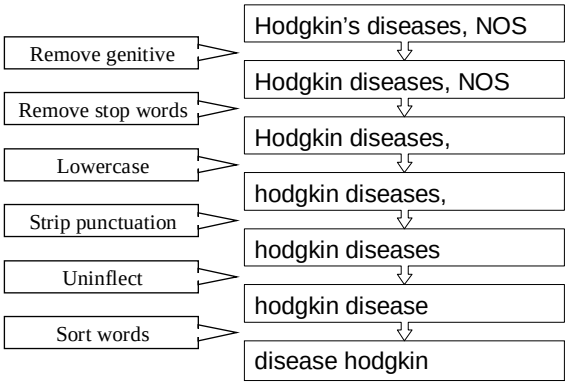
Normalization



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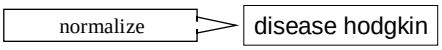
Normalization: Example

Hodgkin Disease
HODGKINS DISEASE
Hodgkin's Disease
Disease, Hodgkin's
Hodgkin's, disease
HODGKIN'S DISEASE
Hodgkin's disease
Hodgkins Disease
Hodgkin's disease NOS
Hodgkin's disease, NOS
Disease, Hodgkins
Diseases, Hodgkins
Hodgkins Diseases
Hodgkins disease
hodgkin's disease
Disease, Hodgkin



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Normalization Applications

- Model for lexical resemblance
- Help find lexical variants for a term
  - Terms that normalize the same usually share the same LUI
- Help find candidates to synonymy among terms
- Help map input terms to UMLS concepts

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Indexes

- Word index
  - word to Metathesaurus strings
  - one word index per language
- Normalized word index
  - normalized word to Metathesaurus strings
  - English only
- Normalized string index
  - normalized term to Metathesaurus strings
  - English only

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Lexical Variant Generation program

- Tool for specialists (linguists)
- Performs atomic lexical transformations
  - generating inflectional variants
  - lowercase
  - …
- Performs sequences of atomic transformations
  - a specialized sequence of transformations provides the normalized form of a term (the *norm* program)

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Part II
How to use the UMLS?

Outline

- Part II: *How to use the UMLS?*
  - Obtaining a license
  - Remote access
    - Knowledge Source Server (UMLSKS)
    - UMLSKS Application programming interface (API)
  - Local installation and customization (MetamorphoSys)

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Part II
How to use the UMLS?

(1) Obtaining a license

First step License agreement

- Online Web-based license:
  http://www.nlm.nih.gov/research/umls/license.html
  - Read license
  - Read appendix
  - Print a copy for your records
  - Complete the Web form

  - Verify:
    - receive e-mail from NLM; go to Web site within 72 hours and enter first and last name
  - NLM official will countersign (turn-around time of a few days)
  - Receive 2nd e-mail from NLM with new license number

NLM

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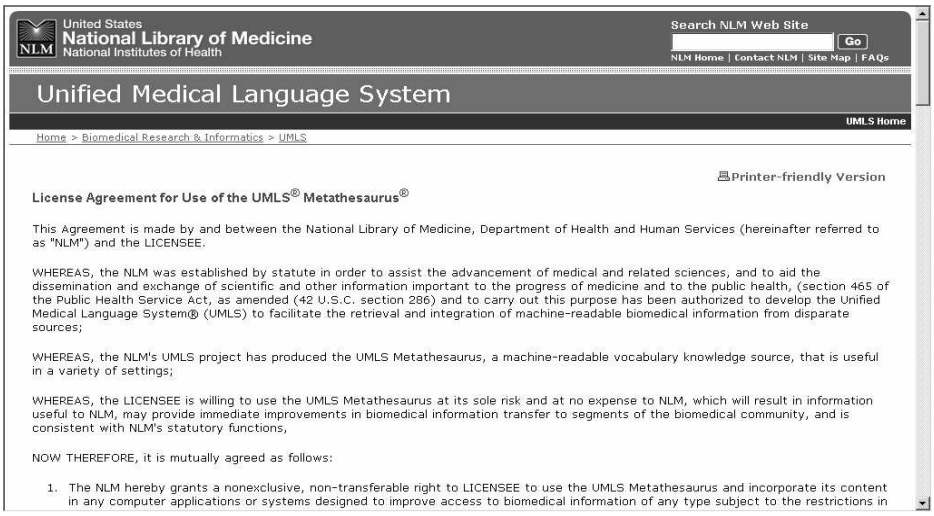
http://www.nlm.nih.gov/research/umls/license.html



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Unified Medical Language System

UMLS Home

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WHEREAS, the NLM's UMLS project has produced the UMLS Metathesaurus, a machine-readable vocabulary knowledge source, that is useful in a variety of settings;

WHEREAS, the LICENSEE is willing to use the UMLS Metathesaurus at its sole risk and at no expense to NLM, which will result in information useful to NLM, may provide immediate improvements in biomedical information transfer to segments of the biomedical community, and is consistent with NLM's statutory functions,

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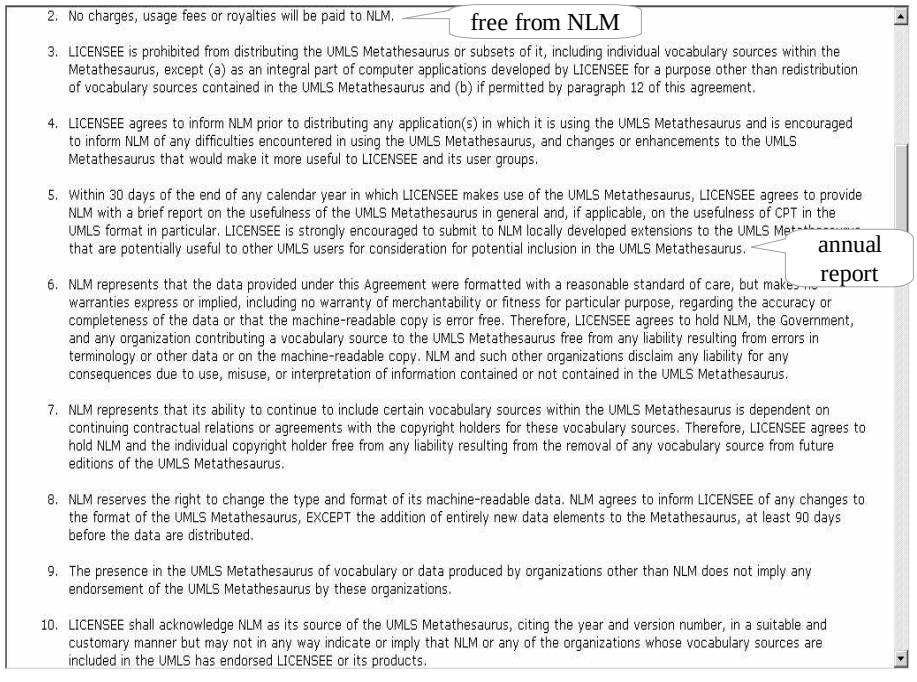

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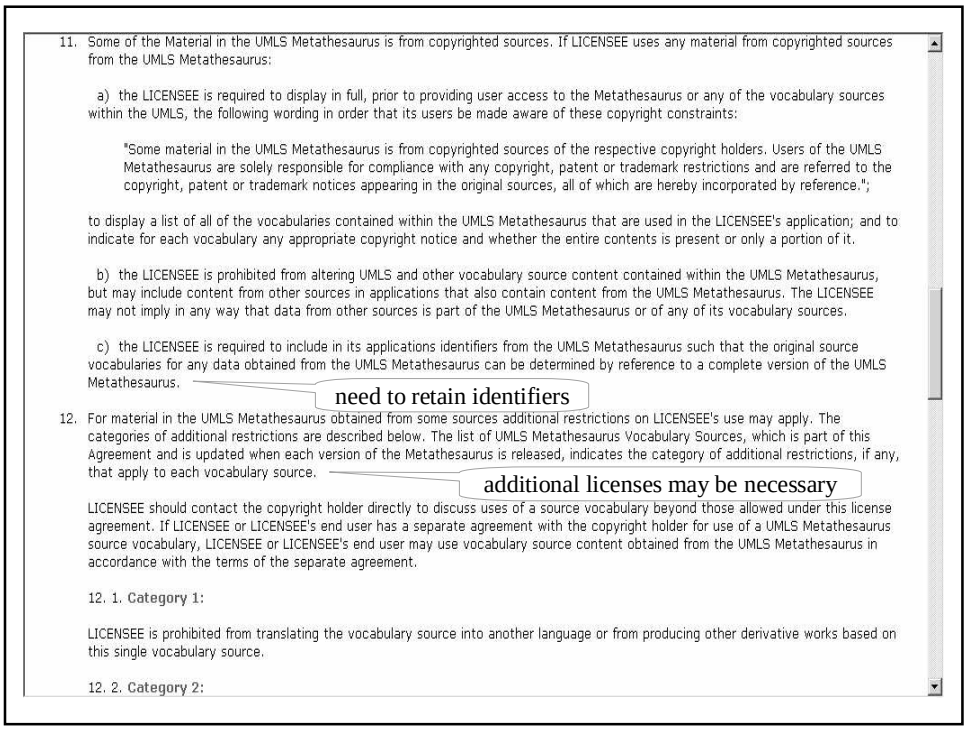

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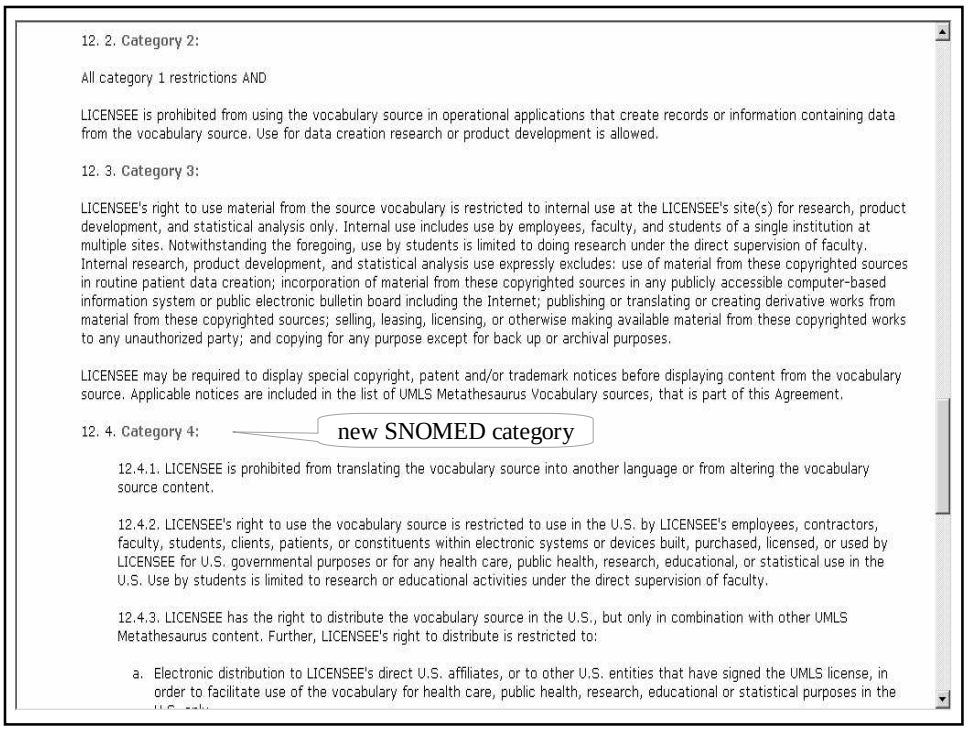

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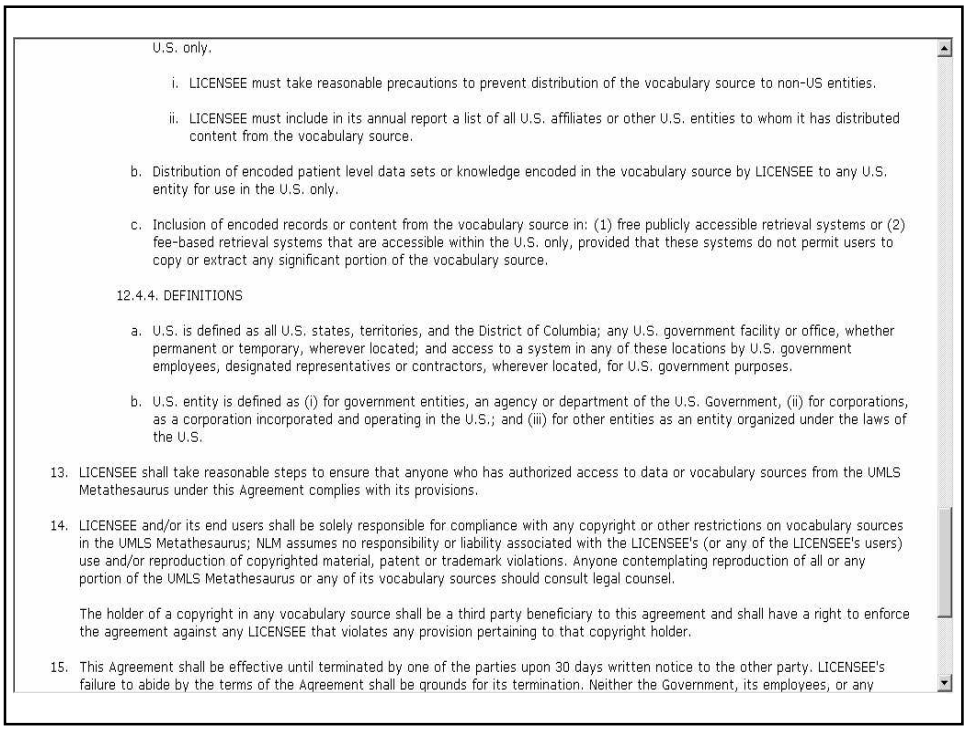

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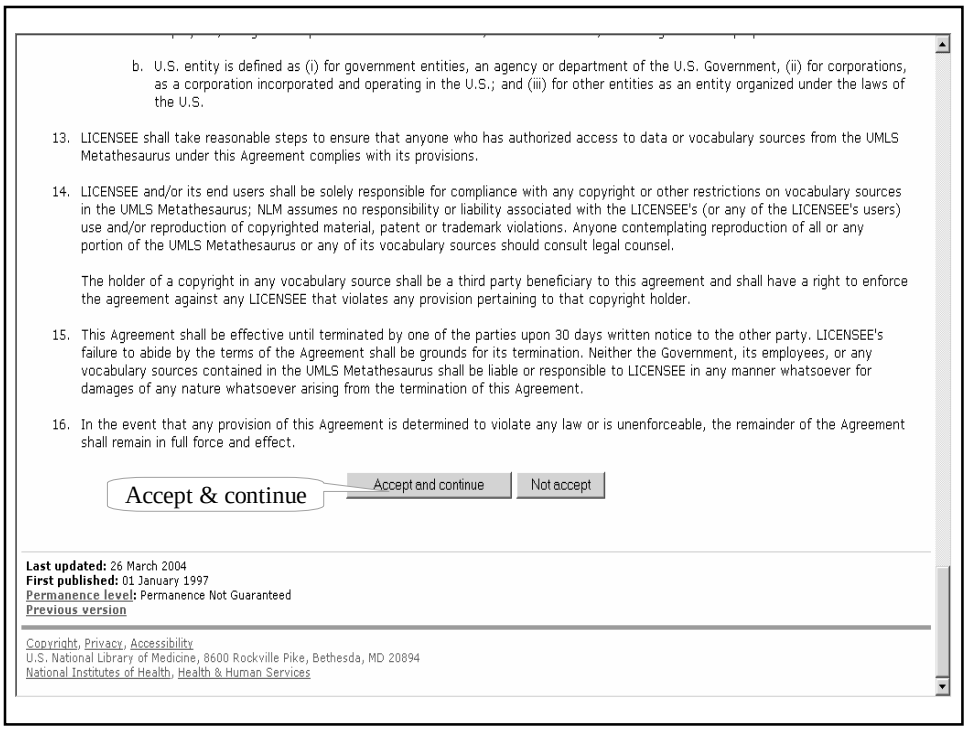

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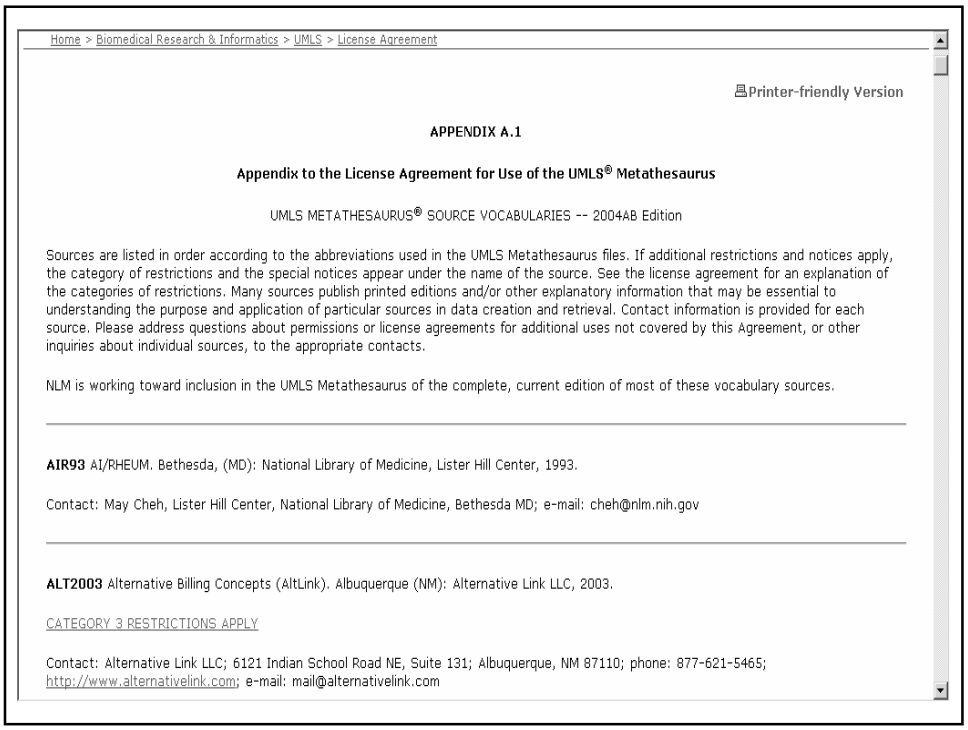
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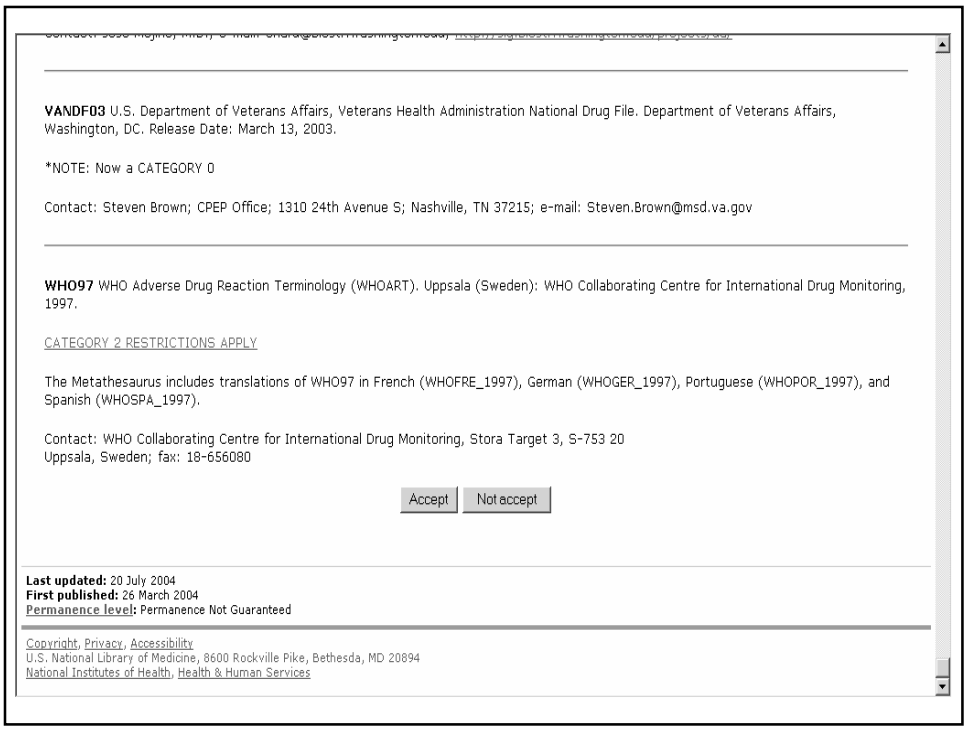
NLM is working toward inclusion in the UMLS Metathesaurus of the complete, current edition of most of these vocabulary sources.
AIR93 AI/RHEUM. Bethesda, (MD): National Library of Medicine, Lister Hill Center, 1993.
Contact: May Cheh, Lister Hill Center, National Library of Medicine, Bethesda MD; e-mail: cheh@nlm.nih.gov
ALT2003 Alternative Billing Concepts (AltLink). Albuquerque (NM): Alternative Link LLC, 2003.
CATEGORY 3 RESTRICTIONS APPLY
Contact: Alternative Link LLC; 6121 Indian School Road NE, Suite 131; Albuquerque, NM 87110; phone: 877-621-5465; http://www.alternativelink.com; e-mail: mail@alternativelink.com


VANDF03 U.S. Department of Veterans Affairs, Veterans Health Administration National Drug File. Department of Veterans Affairs, Washington, DC. Release Date: March 13, 2003.
*NOTE: Now a CATEGORY 0
Contact: Steven Brown; CPEP Office; 1310 24th Avenue S; Nashville, TN 37215; e-mail: Steven.Brown@msd.va.gov
WHO97 WHO Adverse Drug Reaction Terminology (WHOART). Uppsala (Sweden): WHO Collaborating Centre for International Drug Monitoring, 1997.
CATEGORY 2 RESTRICTIONS APPLY
The Metathesaurus includes translations of WHO97 in French (WHOFRE_1997), German (WHOGER_1997), Portuguese (WHOPOR_1997), and Spanish (WHOSPA_1997).
Contact: WHO Collaborating Centre for International Drug Monitoring, Stora Target 3, S-753 20
Uppsala, Sweden; fax: 18-656080
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67%

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Part II
How to use the UMLS?

(2) Remote access

Remote Access

- UMLS Knowledge Source Server:
  http://umlsks.nlm.nih.gov
- Web search interface
- Application Programming Interface (API)

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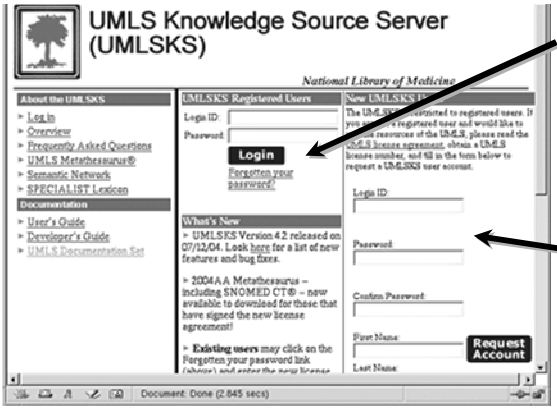
Knowledge Source Server
Web search interface

UMLSKS Web search interface

- Logging in
- Basic searching
- Advanced searching

81

UMLSKS Web search interface log in

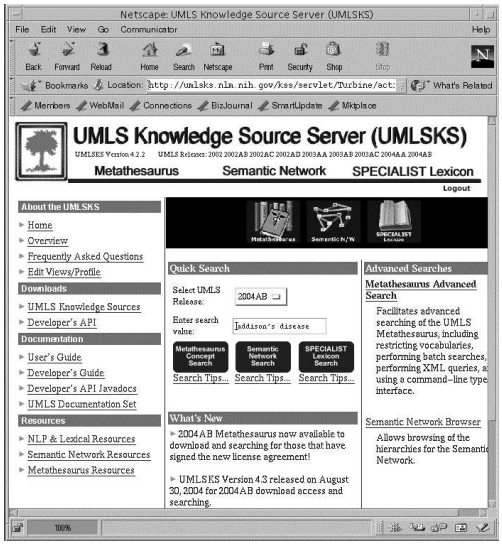


- Returning users log in
- New users create account

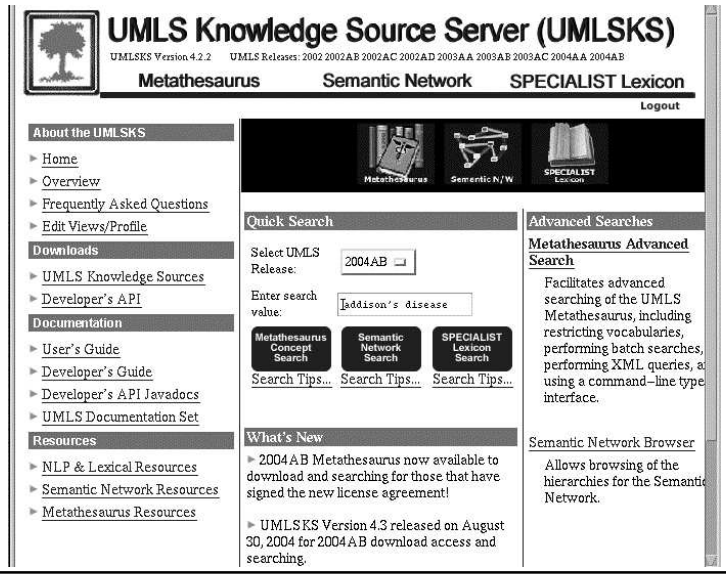
82

UMLS Knowledge Source Server Home Page

- Tabs across top access basic searching of 3 Knowledge Sources
- Advanced searching options on right-hand side



UMLS Knowledge Source Server Home Page



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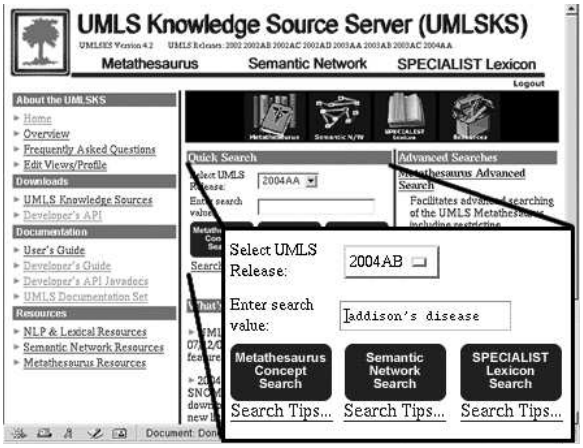
Metathesaurus Basic Search
Addison's disease



- UMLS Release
- Search Term
- UMLS Knowledge Source

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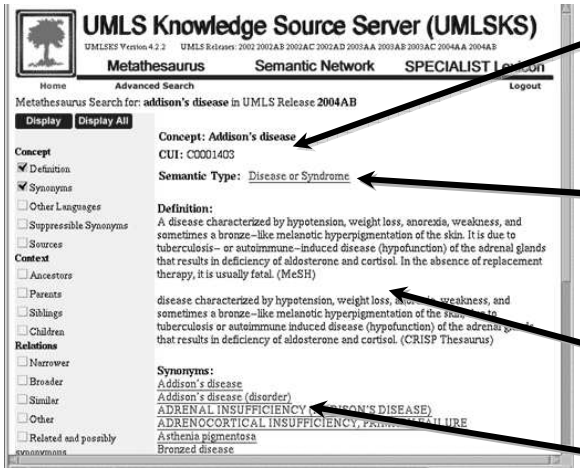
Concept Report *Addison's disease*



- Concept Name /CUI
- Semantic Type(s)
- Definition(s)
- Synonyms

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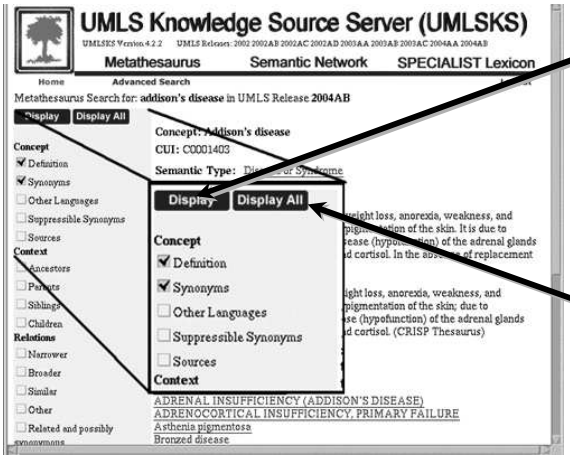
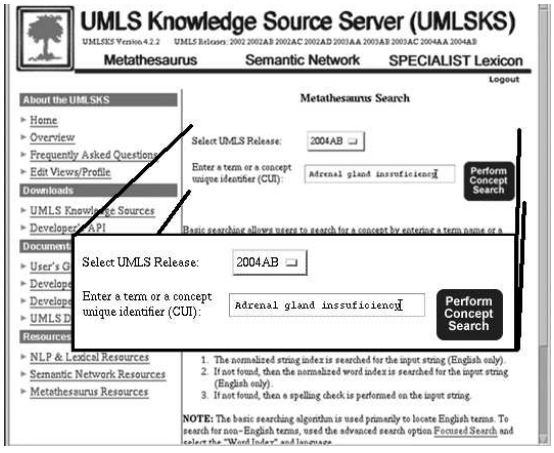
Display All



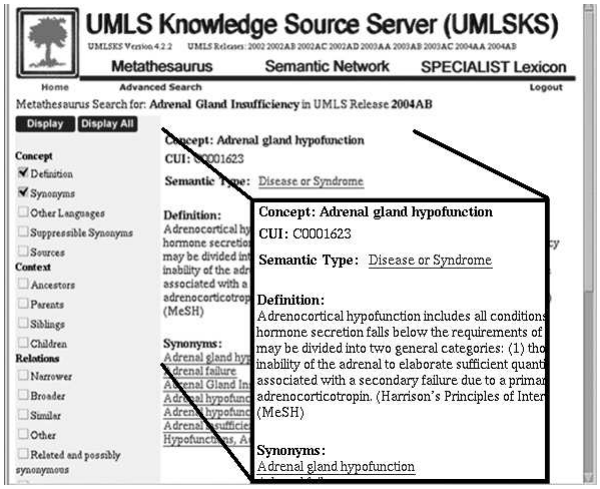
- "Display" shows results for selected options
- "Display All" shows results for all available options

Metathesaurus Basic Search
Adrenal gland insufficiency

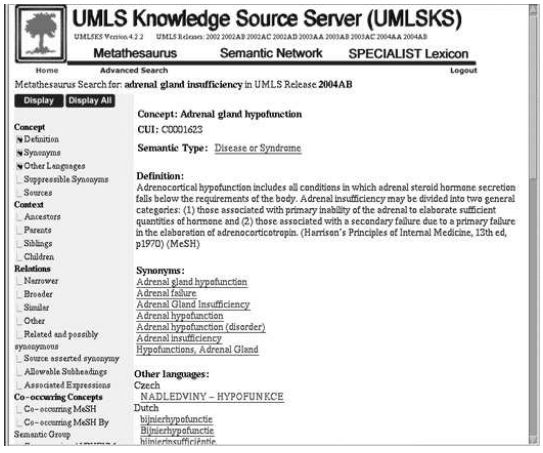


- Specify:
  - UMLS Release
  - Search term
- Algorithm:
  - Search Normalized String
  - Search Normalized Word
  - Suggest Spelling

Basic Concept Report
Adrenal gland insufficiency



Concept Report Display All
Adrenal Gland Insufficiency



- Concept Name/CUI
- Semantic Type(s)
- Definition(s)
- Synonyms, including foreign languages
- Relations (broader, narrower, etc.)
- Co-occurrence data

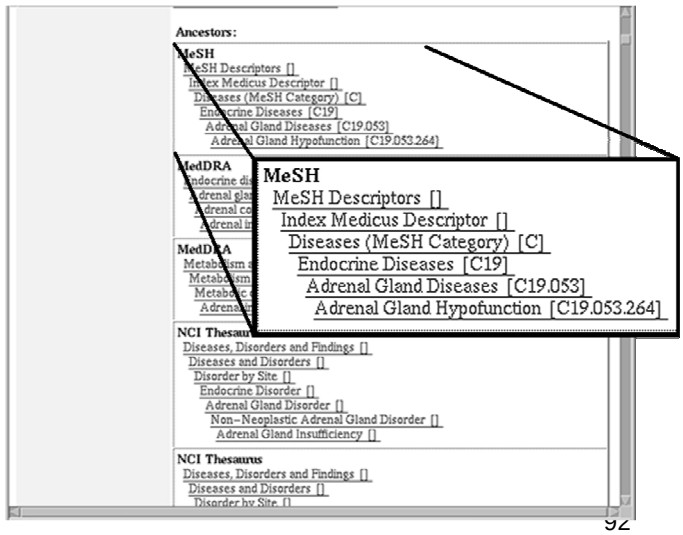
Concept Report Display All (continued)

Synonyms

Sources

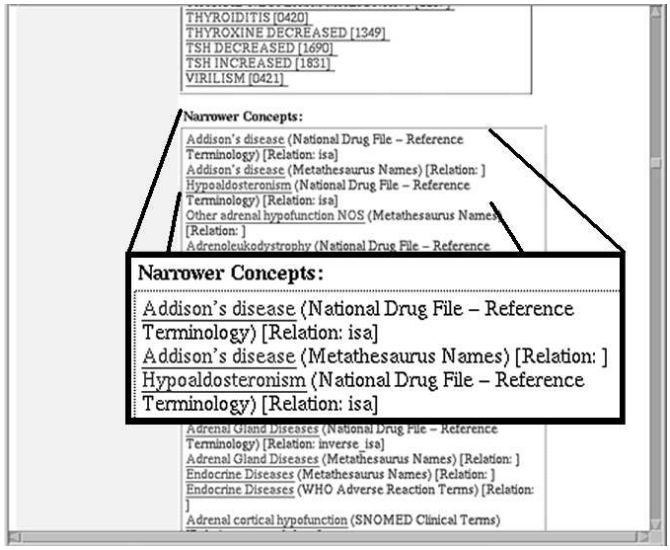
Concept Report Display All (continued)

Hierarchies



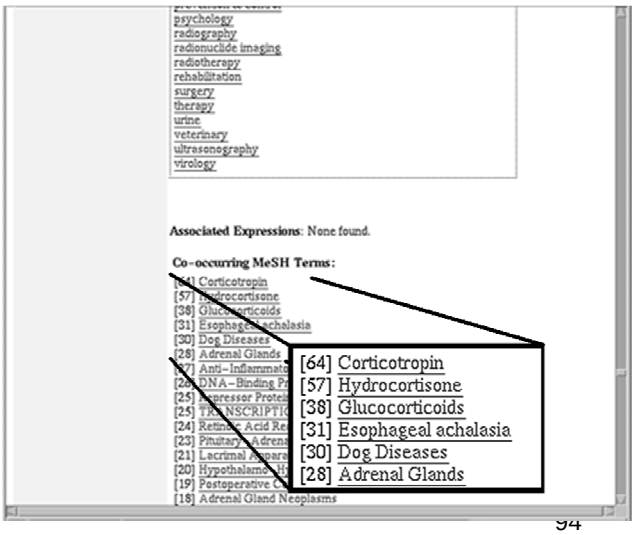
Concept Report Display All (continued)

Relations



Concept Report Display All (continued)

Co-occurrence data



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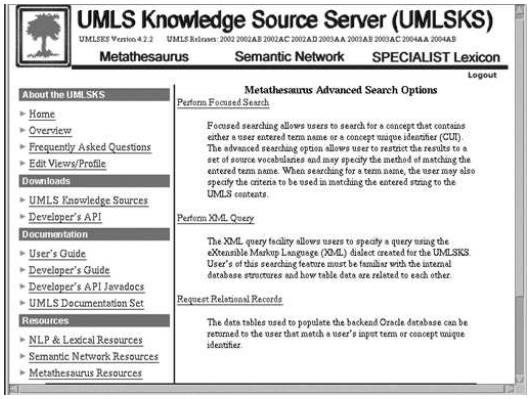
Metathesaurus Advanced Search Options

- Focused Search
- Raw Relational Records



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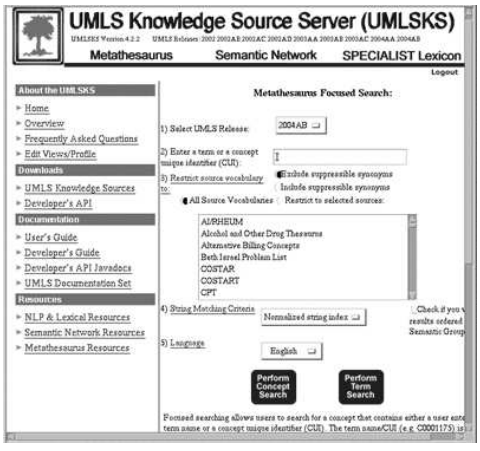
Metathesaurus Advanced Search Feature Focused Search



- UMLS Release
- Search Term
- Source Vocabularies
- String Criteria
  - Exact Match
  - Normalized string & word
  - Word
  - Truncation (left/right)
  - Approximate Match
- Language

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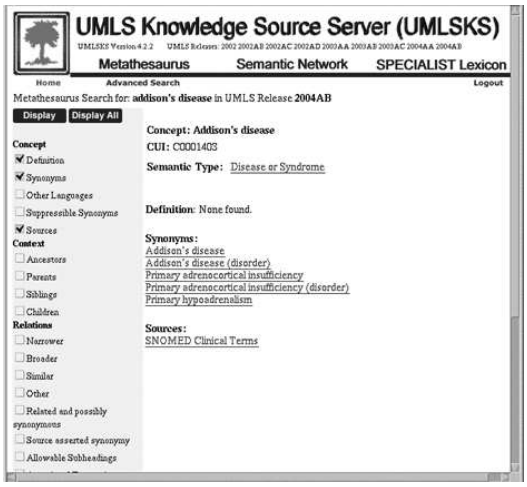
Restricted Source Concept Report
Addison's Disease



- UMLS Release:
  2004AB
- Search Term:
  addison's disease
- Source Vocabulary:
  SNOMED CT
- String Criteria:
  Normalized string
- Language:
  English

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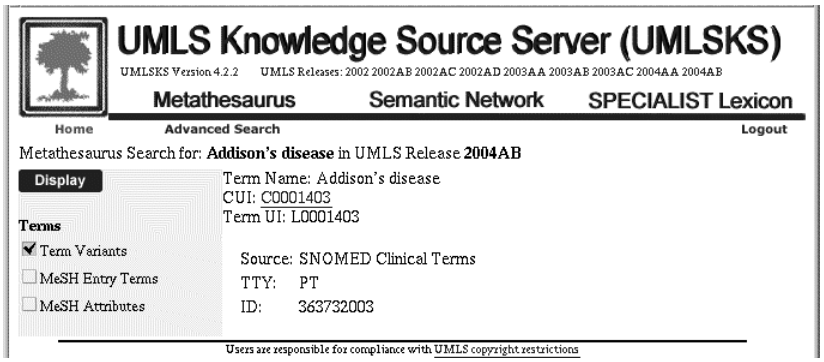
Addison's disease in SNOMED CT
Preferred Term and Code



- TTY: Term Type
- ID: Source Code Descriptor

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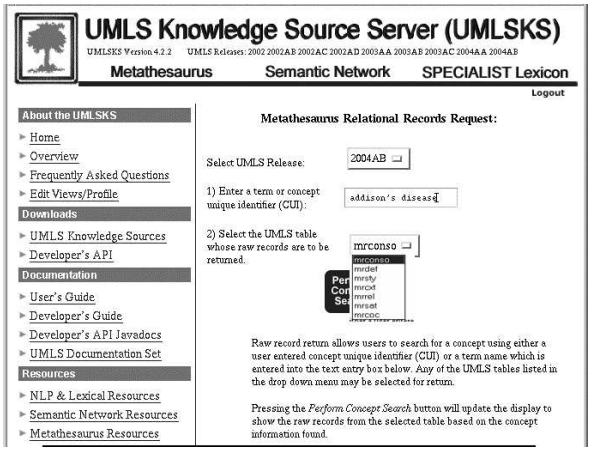
Metathesaurus Advanced Search Feature Relational Record Request

- UMLS Release
- Search Term
- UMLS Relational Table



Relational Records MRCONSO.RRF

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CUI|LAT|TS|LUI|STT|SUI|ISPREF|AUI|SAUI|SCUI|SDUI|SAB|TTY|CODE|STR|SUPPRESS|CVF|
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C0001403|DUT|P|L2048638|PF|S2386860|N|A6566810|||10001130|MDRDUT|LT|10001130|Addison, ziekte
C0001403|DUT|P|L2048638|PF|S2386860|Y|A3931189|||D000224|MSHDUT|MH|D000224|Addison, ziekte v
C0001403|DUT|S|L2048637|PF|S2386859|Y|A3931188|||D000224|MSHDUT|SY|D000224|Addison, syndroom
C0001403|DUT|S|L2528364|PF|S2985131|Y|A3966882|||D000224|MSHDUT|SY|D000224|Ziekte van Addiso
C0001403|DUT|S|L3205108|PF|S3732602|N|A5146733||E27.1|||ICD10DUT|PT|E27.1|Primaire bijniersch
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C0001403|DUT|S|L4999270|PF|S5686775|N|A6627493|||10052381|MDRDUT|LT|10052381|primaire bijnie
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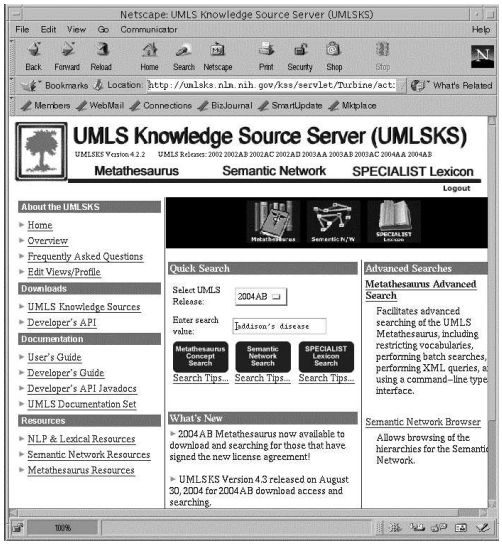
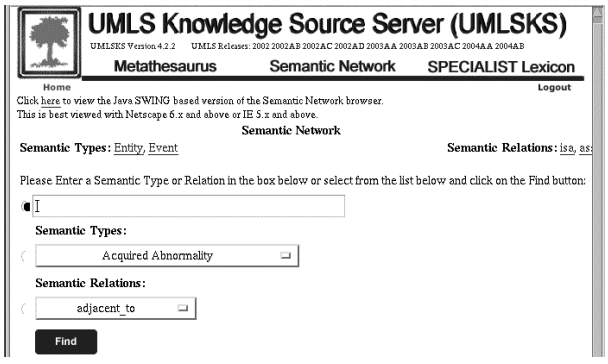
C0001403|ENG|P|L0001403|PF|S0354372|N|A0388276||||AOD|DE|0000006012|Addison's disease|0||
C0001403|ENG|P|L0001403|PF|S0354372|N|A0388277|||0060-3321|CSP|PT|0060-3321|Addison's diseas
C0001403|ENG|P|L0001403|PF|S0354372|N|A0388279||||LCH|PT|U000061|Addison's disease|0||
C0001403|ENG|P|L0001403|PF|S0354372|N|A0388280|||10001390|MDR|LT|10001130|Addison's disease|
C0001403|ENG|P|L0001403|PF|S0354372|N|A0388281||||RCD|PT|C1541|Addison's disease|3||
```

Semantic Network Searching

- Select Tab along top
- Quick search
- Advanced Search on right-hand side



Semantic Network Search



- Enter search string

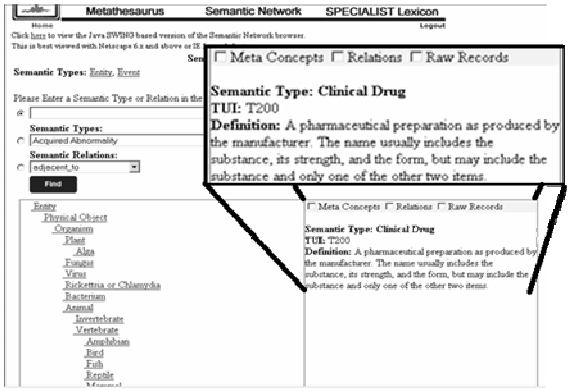
  -or-

- Select semantic type

  -or-

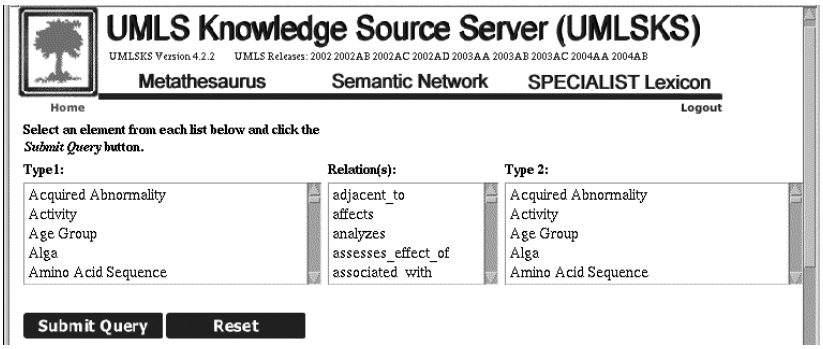
- Select semantic relation

Semantic Type Clinical Drug



- Browse ST hierarchy
- View Concepts with ST
- View Relations valid for the ST
- View Raw Relational Records

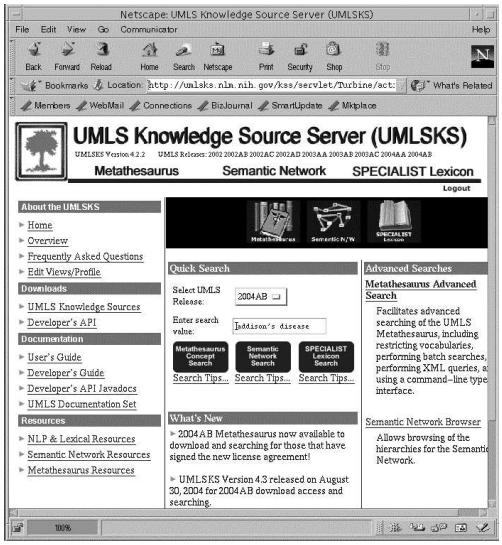
Show Relations Between Types



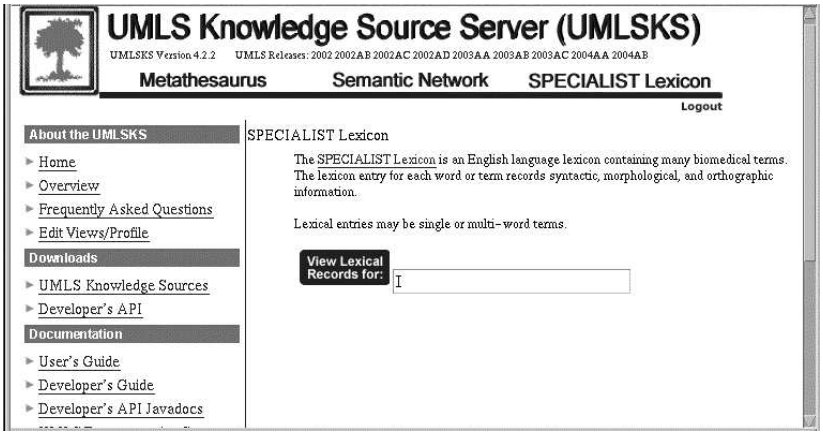
- Validates whether a selected Semantic Relationship (SR) holds between two selected Semantic Types (ST)

SPECIALIST Lexicon Searching

- Select Tab along top
- Quick search



SPECIALIST Lexicon Search



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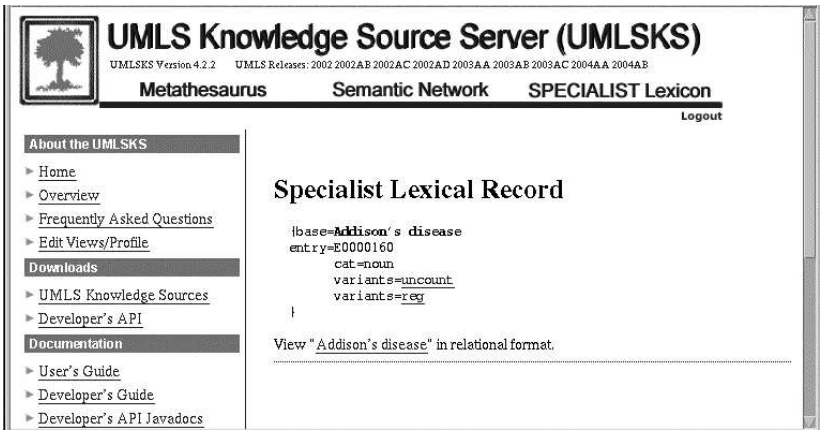
SPECIALIST Lexical Record



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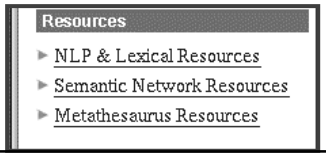
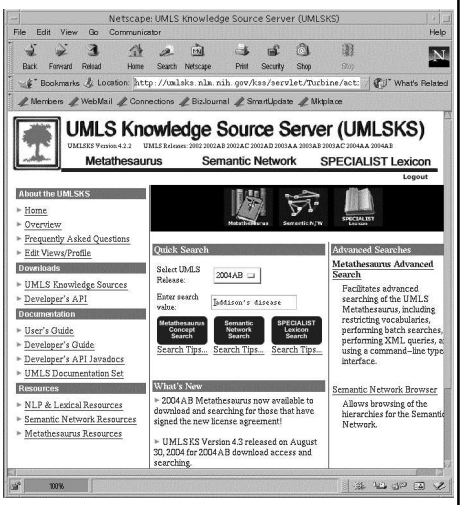
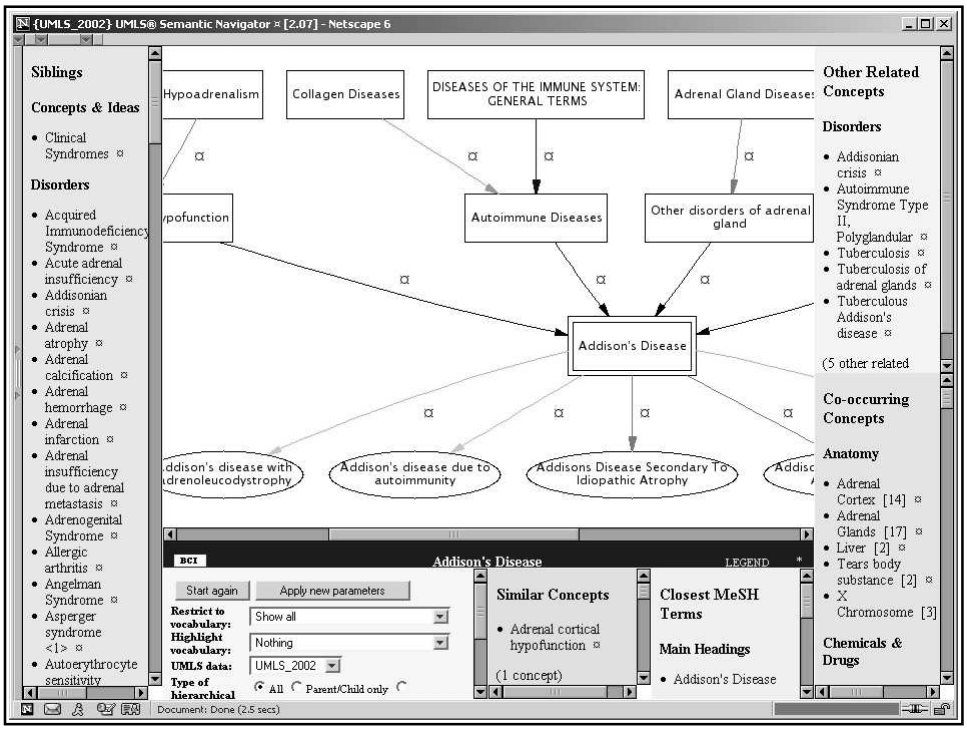
UMLS Resources

- NLP & Lexical Resources
  - MetaMap Transfer (MMTx)
  - Word Sense Disambiguation (WSD) Test Collection
- Semantic Network
  - Semantic Navigator
  - Semantic Groups
- Metathesaurus
  - String Properties





108



Knowledge Source Server

Application Programming Interface

UMLSKS API basics

- Remote server at NLM
- Local application connected through

Java RMI	TCP/IP socket
◆ Java-based applications ◆ Developer's Guide: Chapter 3 ◆ Set of Java classes (part of the UMLSKS API download) ◆ Detailed *Javadoc* documentation online and with API download	◆ XML-based queries ◆ Developer's Guide: Chapter 5 ◆ XML schema ◆ Socket server ● Host: umlsks.nlm.nih.gov ● Port: 8042

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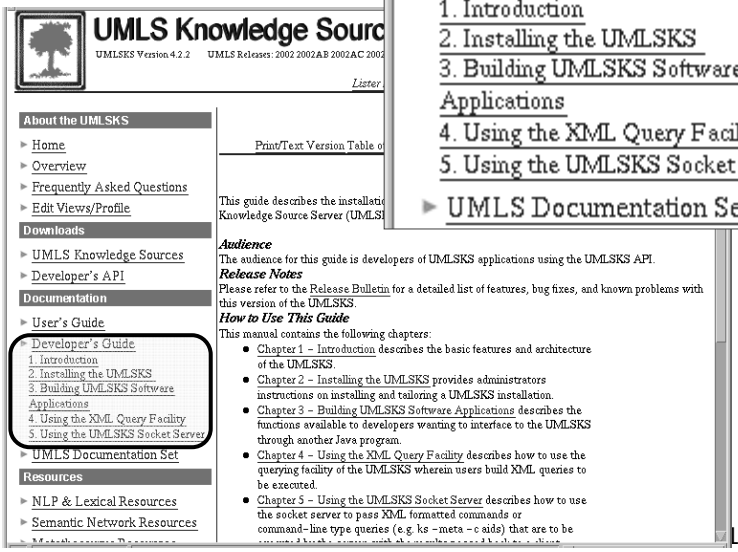
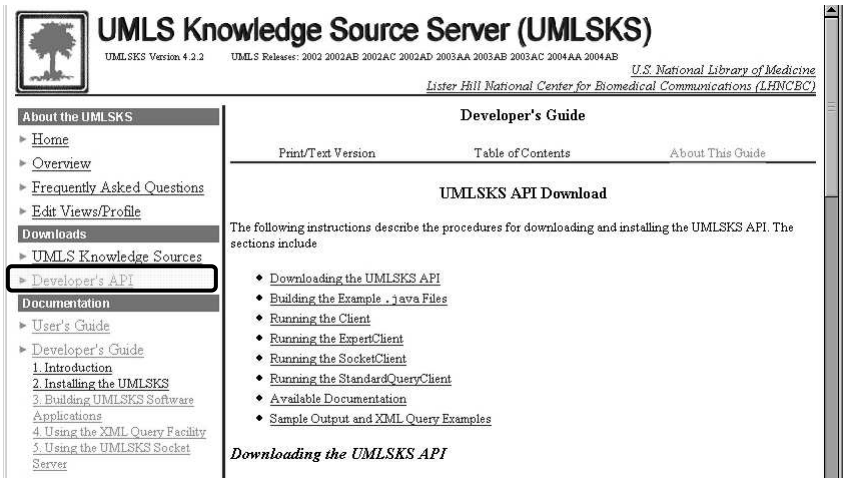
Developer's Guide

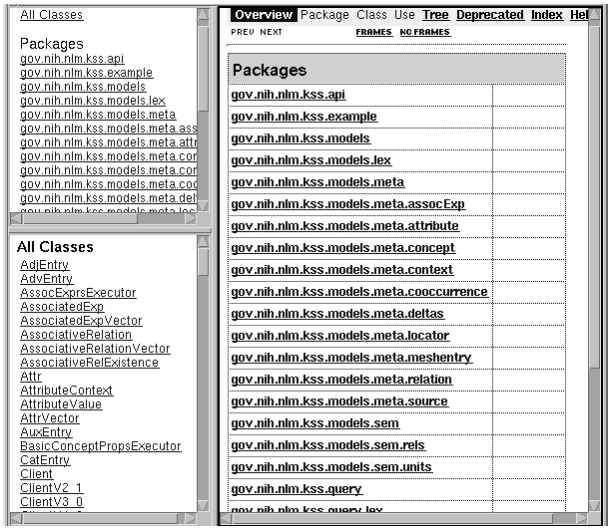


12

Documentation Java API



Documentation Javadocs



Sample XML query (1) Current version

```
<?xml version="1.0"?>
<getCurrentUMLSVersion version="1.0"/>
```

```
<?xml version="1.0"?>
<CurrentUMLSYear version="1.0">
     2004AB
</CurrentUMLSYear>
```

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Sample XML query (2) Concepts by string

```
<?xml version="1.0"?>
<findCUI version="1.0">
<conceptName>appendicectomy</conceptName>
<language>ENG</language>
<exact/>
<noSuppressibles/>
</findCUI>
```

```
<?xml version="1.0"?>
<ConceptIdCollection version="1.0">
  <release>2004AB</release>
   <conceptId>
      <cui>C0003611</cui>
      <cn>Appendectomy</cn>
   </conceptId>
</ConceptIdCollection>
```

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Sample XML query (3) Concepts properties

```
<?xml version="1.0"?>
<getSemanticType version="1.0">
<cui>C0033572</cui>
</getSemanticType>
```

```
<?xml version="1.0"?>
<SemanticTypeCollection version="1.0">
<release>2004AB</release>
<cui>C0033572</cui>
<cn>Prostate</cn>
      <semanticType>
         <tui>T023</tui>
         <sty>Body Part, Organ,
              or Organ Component</sty>
      </semanticType>
</SemanticTypeCollection>
```

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Sample XML query (4) Relationships

```
<?xml version="1.0"?>
<getRelations version="1.0">
<cui>C0033572</cui>
<rel>RO</rel>
</getRelations>
```

```
<?xml version="1.0"?>
<RelationCollection version="1.0">
[…]
      <relation>
         <rel>RO</rel>
         <cui2>C0005001</cui2>
         <cn2>Benign prostatic hyperplasia</cn2>
         <rela>has_finding_site</rela>
         <sab>SNOMEDCT</sab>
         <sl>SNOMEDCT</sl>
</relation>
[…]
```

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Sample XML query (5) All semantic type IDs

```
<?xml version="1.0"?>
<listSemTypeIds version="1.0">
</listSemTypeIds>
```

```
<?xml version="1.0"?>
<SemNetIdCollection version="1.0">
      <release>2004AB</release>
      <semnetId>
         <name>Acquired Abnormality</name>
         <ui>T020</ui>
         <semtype/>
      </semnetId>
      <semnetId>
         <name>Activity </name>
         <ui>T052</ui>
         <semtype/>
      </semnetId>
[…]
```

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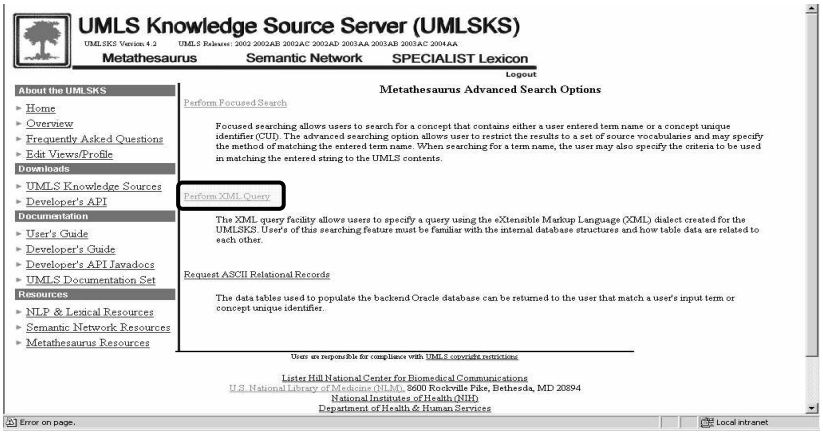
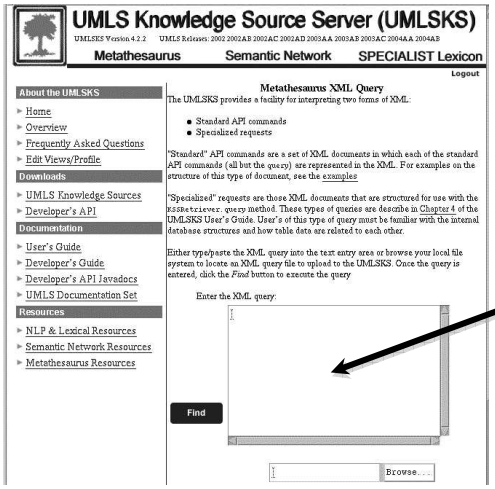
Performing XML queries from UMLSKS



120

Performing XML queries from UMLSKS




```
<?xml version="1.0"?>
<getRelations>
<cui>C0033572</cui>
<rel>RO</rel>
</getRelations>
```

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Part II
How to use the UMLS?

(3) Installing the UMLS locally and Customizing the Metathesaurus using MetamorphoSys

What is MetamorphoSys?

- Tool distributed with the UMLS
- Multi-platform Java software
- The UMLS installation and customization wizard
  - Installs Knowledge Sources to local storage
  - Subsets and customizes a local Metathesaurus

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Using MetamorphoSys

- Simple to use
- Screens and tabs lead you through process
- Installs NLM data format files to local storage

124

Why use MetamorphoSys?

Customize the Metathesaurus

- To remove terminology that is unhelpful, or even harmful, to your needs and purposes
- To comply with terms of license agreement

125

Why use MetamorphoSys?

Changing Default Settings

- To alter the preferred name
- To alter suppressibility of specific source term types

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Customization is Critical

- Requires a clear understanding of:
  - Characteristics of source vocabularies
  - License arrangements
  - User's functional requirements
  - User's purpose and perspective
- Technical expertise

… and requires a multidisciplinary technical team

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Machine Requirements

- A fast CPU – 1 GHz or higher
- 1 GB RAM recommended (512 MB min.)
- 6x (or better) DVD drive
- 22 GB minimum free disk space
- Runs on Sun Solaris 8 & 9, Windows XP, NT, and 2000, Linux, and Mac
- 1-10 hours run time on platforms tested

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Download from UMLSKS …

- High speed Internet connection required
- Read the README file for the release
- 2004AB UMLS Files
  - 2004AB.CHK
  - 2004AB.MD5
  - 2004ab-1-meta.nlm
  - 2004ab-2-meta.nlm
  - 2004ab-3-meta.nlm
  - mmsys.zip
  - Copyright_Notice.txt
  - README.txt

Please README!

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...or DVD?

- Order at: umls_support@nlm.nih.gov
- **Include your license number**
- Run MetamorphoSys from DVD
  - Windows
    - Autorun; or go to root directory and click on “windows_mmsys.bat”
  - Linux, Solaris, Macintosh
    - open a terminal window, change to the root directory and type appropriate command: ./linux_mmsys.sh, ./solaris_mmsys.sh, ./macintosh_mmsys.sh

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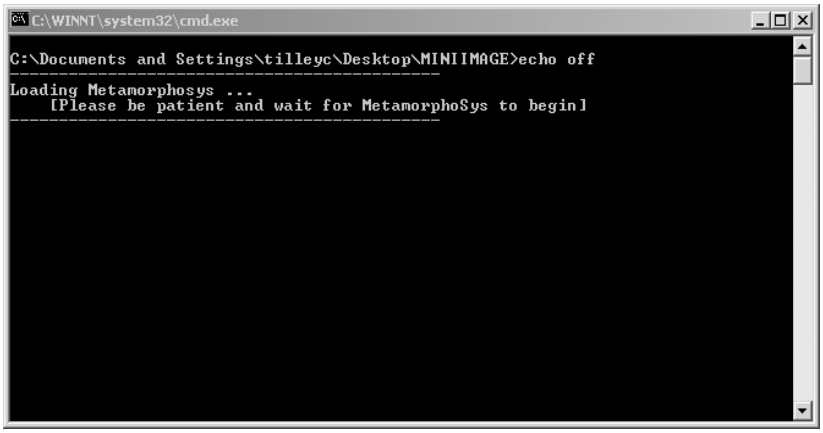
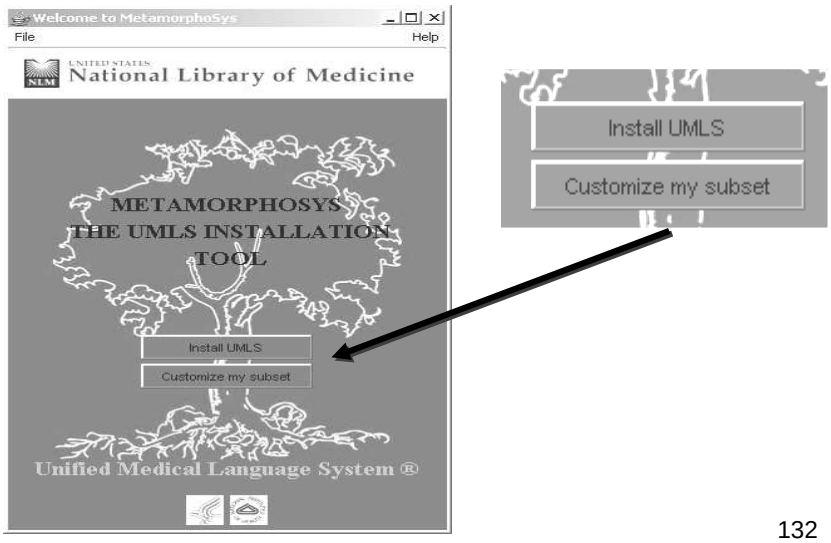
Be patient! A lot of software must load.



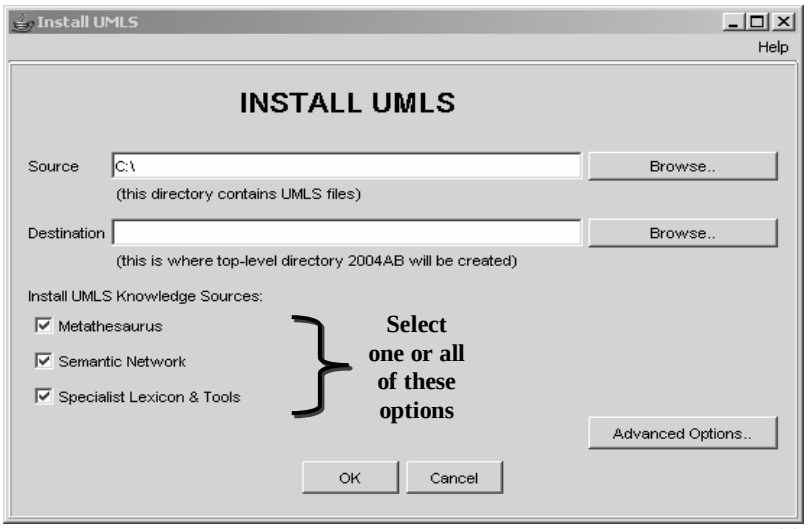
131

Welcome Screen



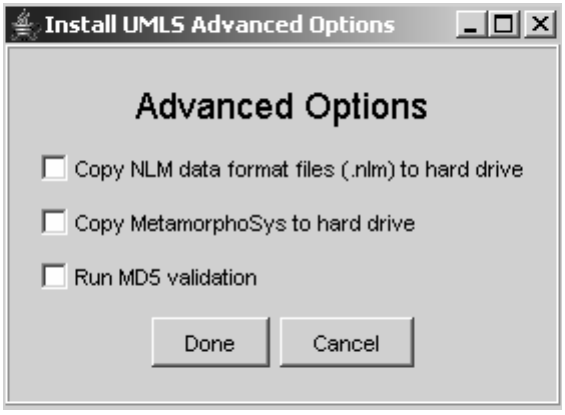
132

Install UMLS



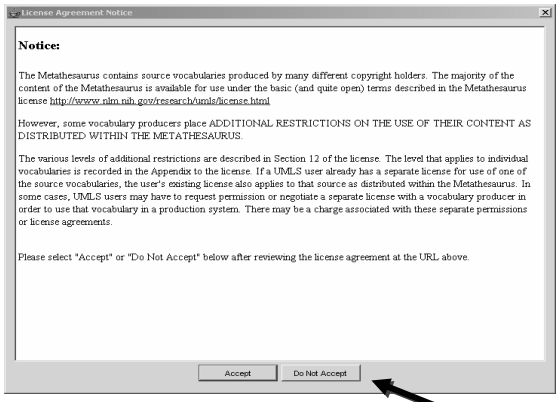
133

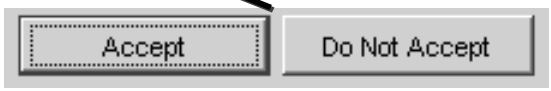
Install UMLS Advanced Options



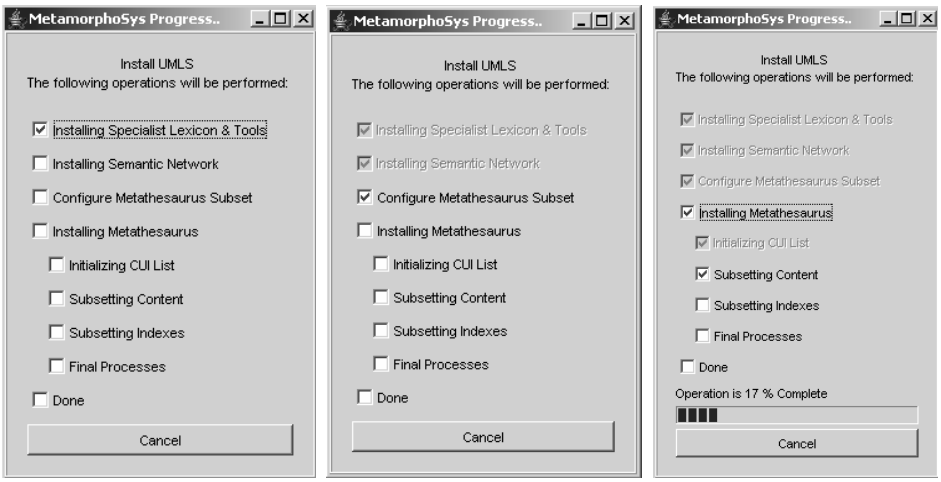
134

UMLS License Notice



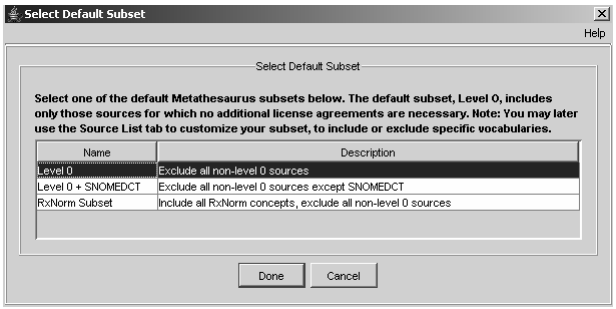


Installation progress monitor



136

Select a default subset



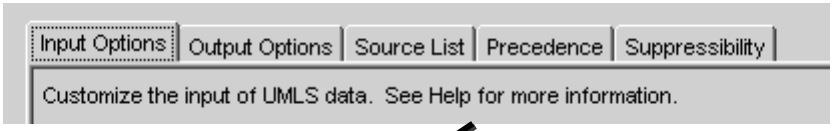
Level 0 → no separate additional license agreements

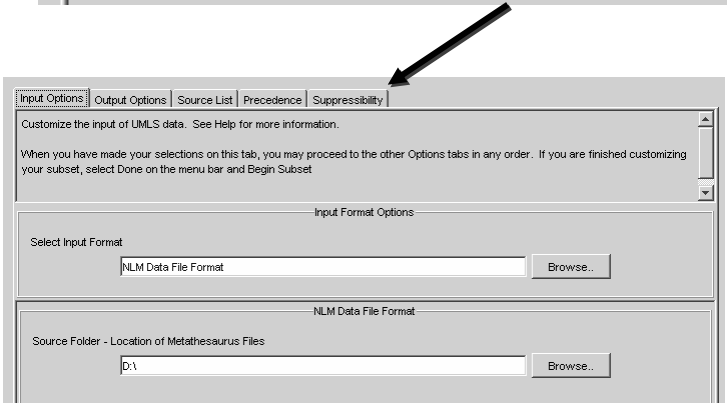
Level 0 + SNOMEDCT → Non-U.S. users must have separate license agreements

RxNorm → no separate additional license agreements

137

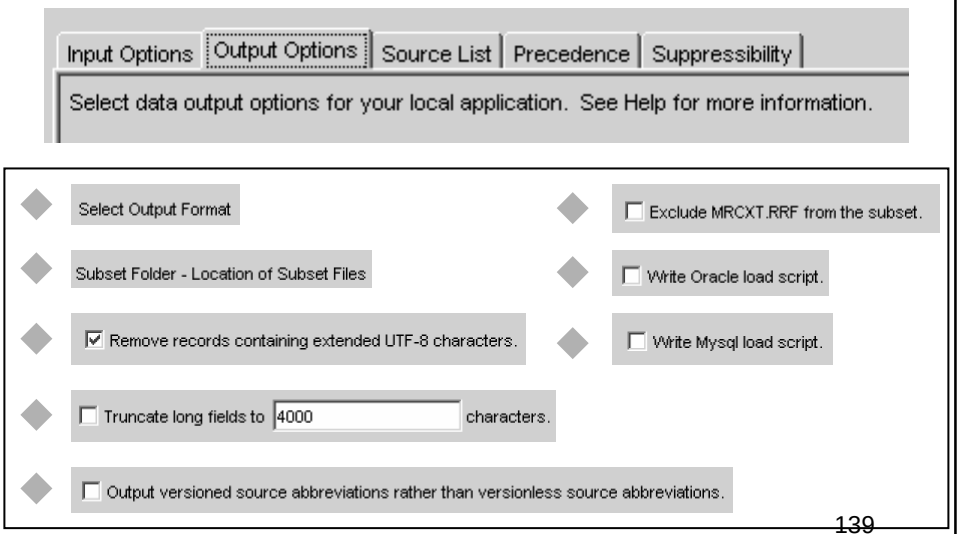
Input Options Tab





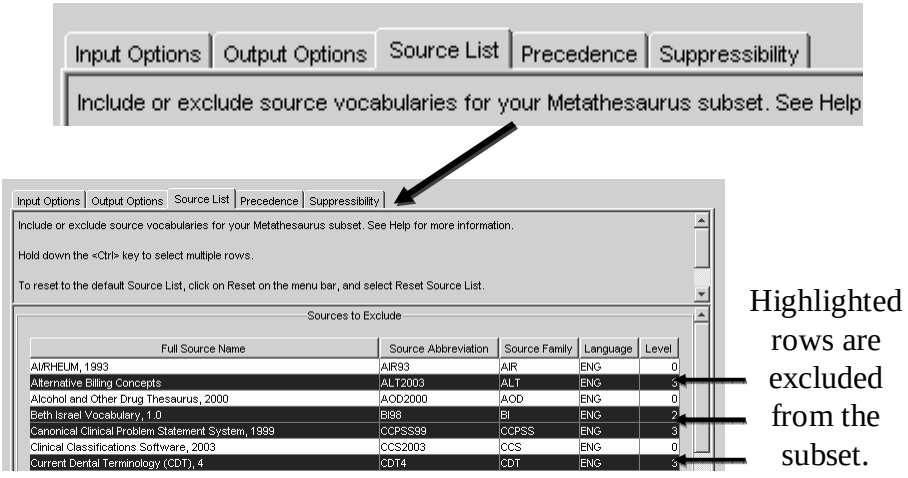
138

Output Options Tab



139

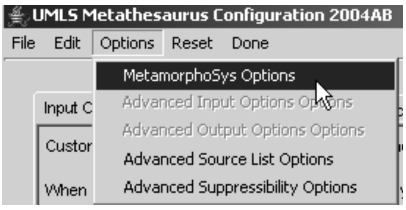
Source List Tab



Highlighted rows are excluded from the subset.

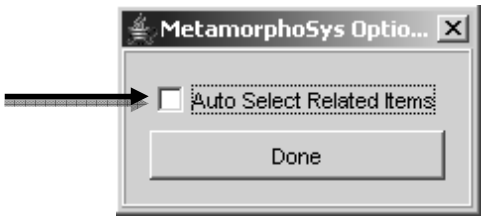
140

MetamorphoSys Option Tab

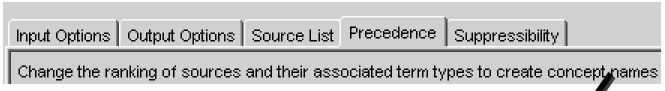


Source list behavior can be changed using the MetamorphoSys Option Tab

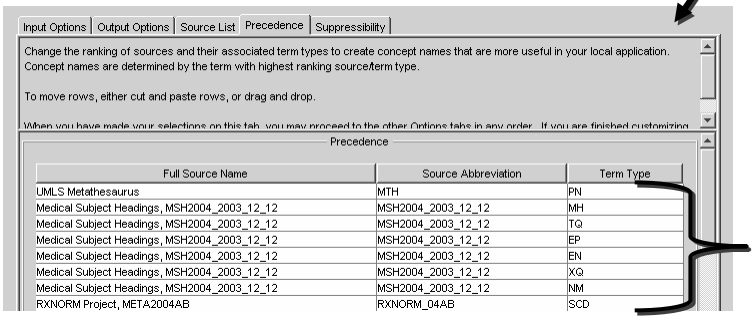
If you wish to Auto Select Related Items check this box



Precedence Tab



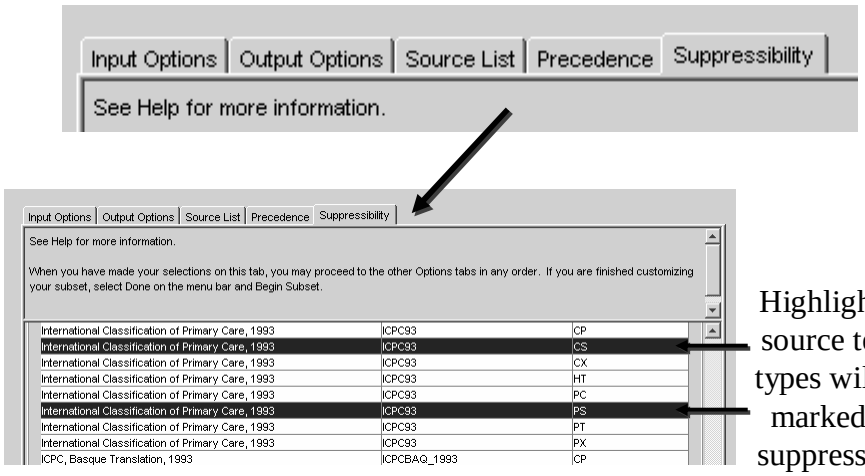
- Ranks names by types of terms within sources
- Highest ranking name determines the Preferred Name



Cut and paste rows to alter the preferred name

142

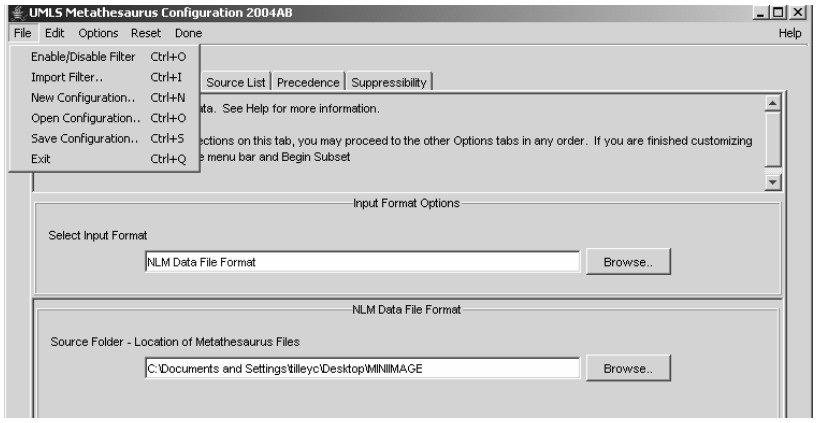
Suppressibility Tab



Highlighted source term types will be marked as suppressible

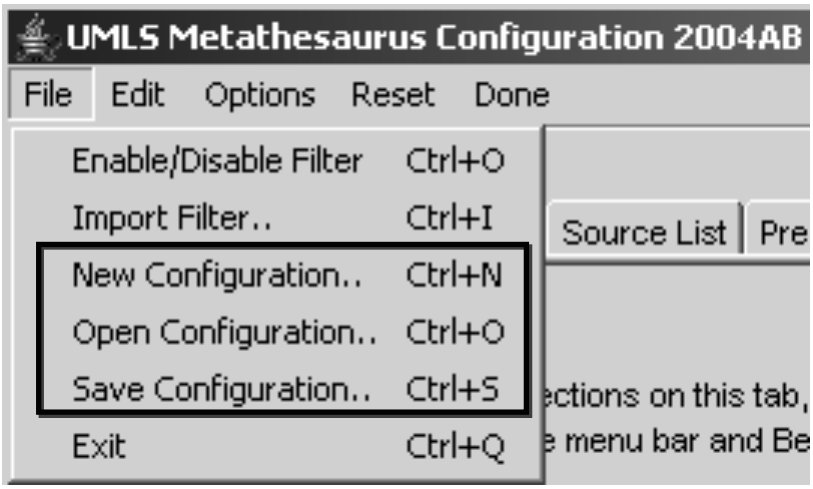
143

File menu



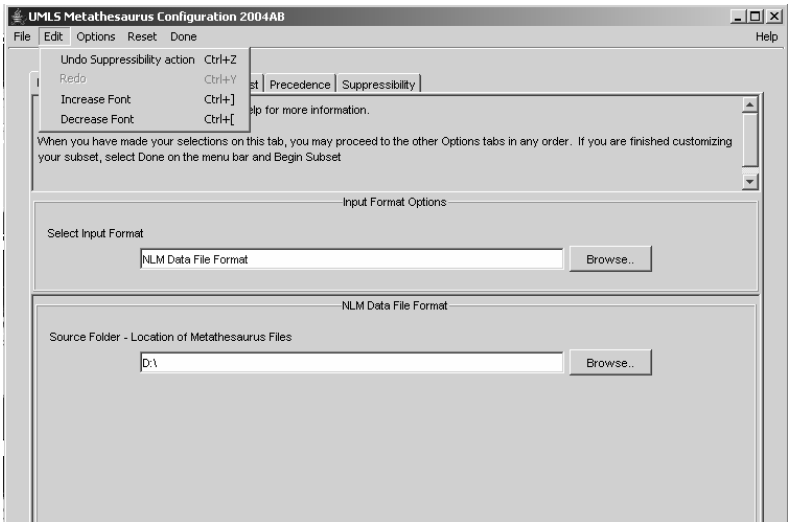
144

File menu



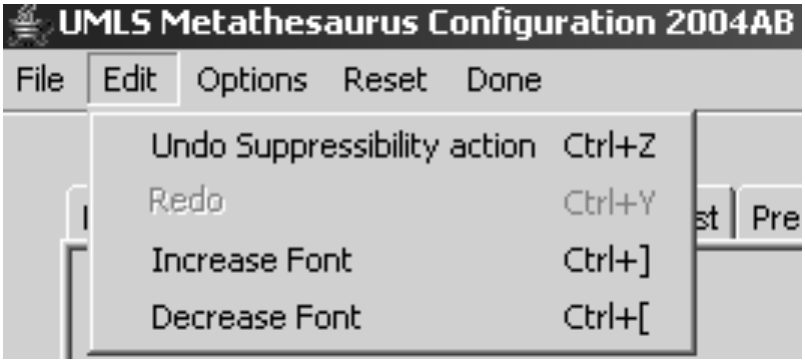
145

Edit menu



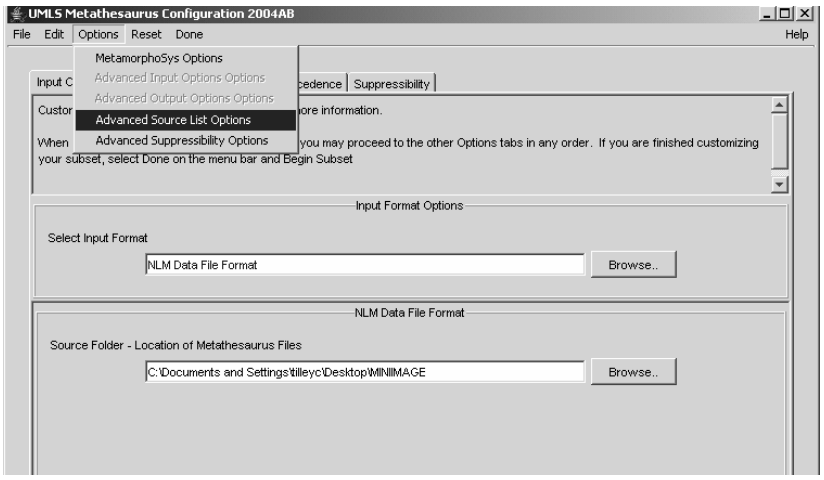
146

Edit menu



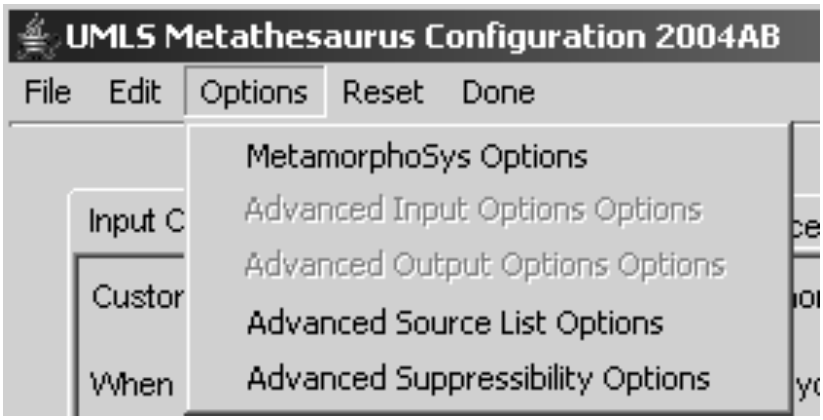
147

Options menu



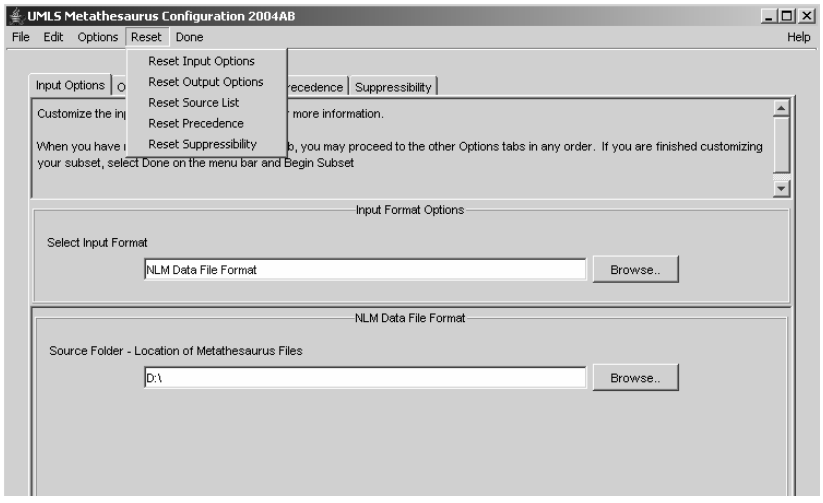
148

Options menu



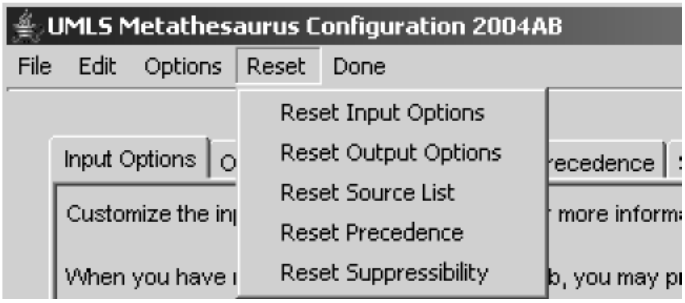
149

Reset menu



150

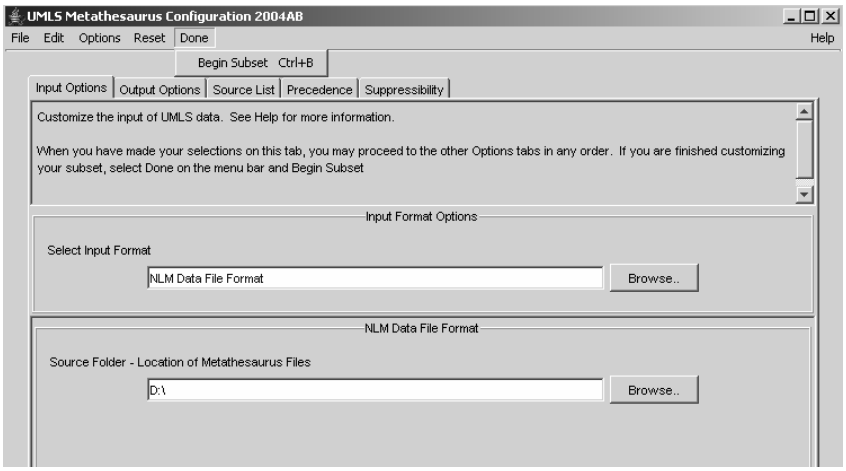
Reset menu



- Returns all filters to default selections
- Default selections in “mmsys.prop.default file” in config folder
- mmsys.prop.default contains properties in last run

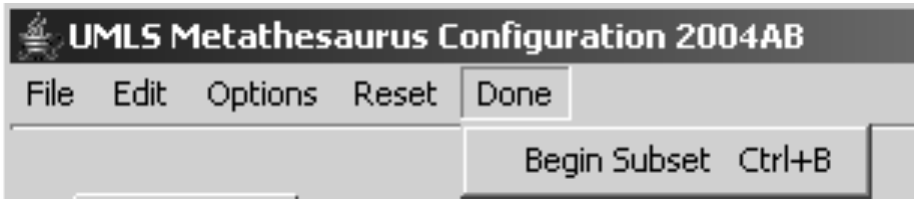
151

Done – Begin Subset



152

Done – Begin Subset



- Compete configuration options
- Done menu
- Begin Subset

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How MetamorphoSys Works

- Removes all information from relational files in excluded vocabularies
  - atoms, strings, relationships, attributes, mappings, etc.
- Applies additional options selected by user
  - such as adding source term suppressibility or altering precedence
- Produces a full set of Metathesaurus files
  - relational files with customized data
  - reflecting other user criteria

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MetamorphoSys log

mmsys.log - Notepad

File Edit Format View Help

```
MetamorphoSys Version:.................5.21
MetamorphoSys Build Date:..............2004_08_30_14_47_11
UMLS Build Date:.......................2004_07_12_09_57_26
Release Version:.......................2004AB
Release Date:..........................20040720
Release Description:...................July 2004 Release
Metathesaurus Source paths:............C:\UMLS\DVDIMAGE
Subsetted Metathesaurus folder:........C:\UMLS\DVDIMAGE\2004AB\META
Start at:..............................Wed Sep 01 13:04:18 EDT 2004
Initialize CUI List completed:.........Wed Sep 01 13:06:20 EDT 2004
Subset Metathesaurus completed:........Wed Sep 01 14:13:02 EDT 2004
Subset Index Files completed:..........Wed Sep 01 14:21:11 EDT 2004
Subset Release Metadata completed:.....Wed Sep 01 14:21:17 EDT 2004
Finished at:...........................Wed Sep 01 14:22:48 EDT 2004
Concepts in source:....................1078246
Concepts in subset:....................1078246
Time elapsed:..........................01:18:29
```

MetamorphoSys log

mmsys.log - Notepad

File Edit Format View Help

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--------------------------------
Metathesaurus Output: Rich Release Format
Long fields were not truncated.
Source Abbreviations were written out with a versionless (root) representation.
Fields containing UTF-8 characters were not removed.


Excluded Sources
  <none>

Kept Sources
  AI/RHEUM, 1993                                                    AIR93
  Alternative Billing Concepts                                      ALT2003
  Alcohol and Other Drug Thesaurus, 2000                            AOD2000
  Beth Israel Vocabulary, 1.0                                       BI98
  Canonical Clinical Problem Statement System, 1999                 CCPSS99
  Clinical Classifications Software, 2003                           CCS2003
  Current Dental Terminology (CDT), 4                               CDT4
  COSTAR, 1989-1995                                                 COSTAR_89-95
  Medical Entities Dictionary, 2003                                 CPM2003
  Physicians' Current Procedural Terminology, Spanish Translation,... CPT01SP
  Physicians' Current Procedural Terminology, 2004                  CPT2004
  CRISP Thesaurus, 2004                                             CSP2004
  COSTART, 1995                                                     CST95
  Diseases Database, 2000                                           DDB00
  German translation of ICD10, 1995                                 DMDICD10_1995
  German translation of UMDNS, 1996                                 DMDUMD_1996
```
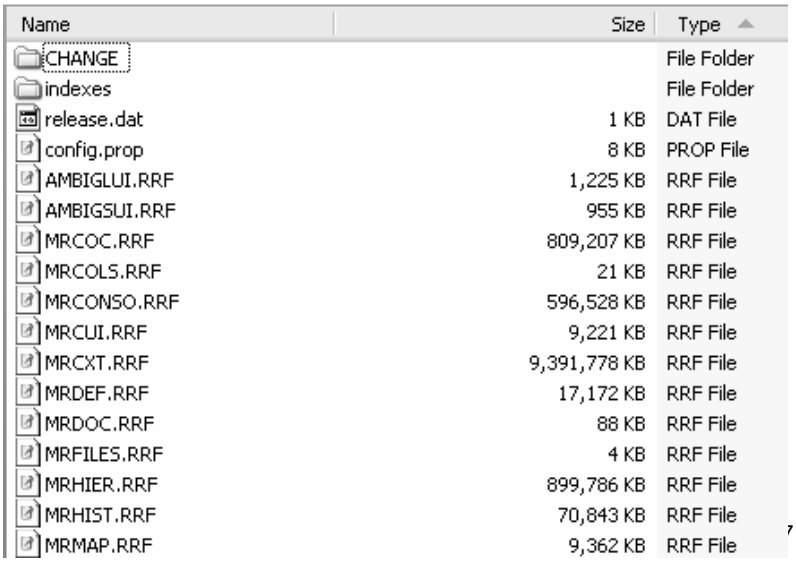

Kept Sources

Output directory contents



Name	Size	Type
CHANGE		File Folder
indexes		File Folder
release.dat	1 KB	DAT File
config.prop	8 KB	PROP File
AMBIGLUI.RRF	1,225 KB	RRF File
AMBIGSUI.RRF	955 KB	RRF File
MRCOC.RRF	809,207 KB	RRF File
MRCOLS.RRF	21 KB	RRF File
MRCONSO.RRF	596,528 KB	RRF File
MRCUI.RRF	9,221 KB	RRF File
MRCXT.RRF	9,391,778 KB	RRF File
MRDEF.RRF	17,172 KB	RRF File
MRDOC.RRF	88 KB	RRF File
MRFILES.RRF	4 KB	RRF File
MRHIER.RRF	899,786 KB	RRF File
MRHIST.RRF	70,843 KB	RRF File
MRMAP.RRF	9,362 KB	RRF File

Summary

UMLS Overview

- UMLS = 3 Knowledge Sources
  - Metathesaurus
  - Semantic Network
  - SPECIALIST Lexicon and Lexical Tools
- MetamorphoSys
  - installs
  - customizes
- UMLSKS
  - remote access
  - resources and documentation

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Questions

Documentation and Support

UMLS documentation and support

- UMLS homepage http://umlsinfo.nlm.nih.gov/
  - with links to all other UMLS information
- UMLSKS homepage http://umlsks.nlm.nih.gov/
  - with links to the User's and Developer's guides
- Email address for support custserv@nlm.nih.gov

Appendix 1

UMLS files in Rich Release Format

MRCONSO (sample rows 1..5) (2004AB)

	1 CUI	2 LAT	3 TS	4 LUI	5 STT	6 SUI	7 ISPREF	8 AUI	9 SAUI	10 SCUI	11 SDUI
1	C0001403	ENG	P	L0001403	PF	S0354372	Y	A4367951			
2	C0001403	ENG	P	L0001403	PF	S0354372	N	A2922421	485624014	363732003	
3	C0001403	ENG	P	L0001403	VC	S0010794	Y	A0019740		M0000346	D000224
4	C0001403	ENG	S	L0494851	PF	S2164152	N	A2018589			
5	C0001403	FRE	P	L3246333	PF	S3773545	Y	A3996251			D000224

	12 SAB	13 TTY	14 CODE	15 STR	16 SRL	17 SUPPRESS	18 CVF
1	MTH	PN	NOCODE	Addison's disease	0	N	
2	SNOMEDCT	PT	363732003	Addison's disease	4	N	
3	MSH	MH	D000224	Addison’s Disease	0	N	
4	MDR	LT	10052381	Primary adrenal insufficiency	3	N	
5	MSHFRE	MH	D000224	Addison, maladie	3	N	

Appendix - Metathesaurus relational files (RRF) 164

MRCONSO (sample rows 6..10) (2004AB)

	1 CUI	2 LAT	3 TS	4 LUI	5 STT	6 SUI	7 ISPREF	8 AUI	9 SAUI	10 SCUI	11 SDUI
6	C0001403	FRE	S	L1272481	PF	S1514427	Y	A1464383			
7	C0001403	GER	P	L1229627	PF	S1471573	Y	A4030156			D000224
8	C0001403	GER	S	L1239271	PF	S1481217	Y	A4034094			D000224
9	C0001403	JPN	P	L3437833	PF	S3965327	Y	A4264008			D000224
10	C0001403	JPN	S	L3465347	PF	S3992841	Y	A4291522			D000224

	12 SAB	13 TTY	14 CODE	15 STR	16 SRL	17 SUPPRESS	18 CVF
6	WHOFRE	IT	0410	MALADIE D'ADDISON	2	N	
7	MSHGER	MH	D000224	Addison-Krankheit	3	N	
8	MSHGER	SY	D000224	Bronzehautkrankheit	3	N	
9	MSHJPN	MH	D000224	Addison病	3	N	
10	MSHPJN	SY	D000224	副腎性黒皮症	3	N	

MRCONSO (sample rows 11-13) (2004AB)

	1 CUI	2 LAT	3 TS	4 LUI	5 STT	6 SUI	7 ISPREF	8 AUI	9 SAUI	10 SCUI	11 SDUI
11	C0001403	POR	P	L3302998	PF	S3831123	N	A6382080			
12	C0001403	RUS	P	L3336992	PF	S3864473	Y	A4157629			
13	C0001403	SPA	P	L1226877	PF	S1468823	Y	A1419475			

	12 SAB	13 TTY	14 CODE	15 STR	16 SRL	17 SUPPRESS	18 CVF
11	MDRPOR	LT	1001130	Doença de Addison	3	N	
12	MSHRUS	MH	D000224	АДДИСОНОВА БОЛІЕЗНЬ	3	N	
13	WHOSPA	IT	0410	ADDISON, ENFERMEDAD	3	N	

MRHIER (sample rows) (2004AB)

	1 CUI	2 AUI	3 CXN	4 PAUI	5 SAB	6 RELA
1	C0001403	A0019740	1	A0020270	MSH	
2	C0001403	A0019740	2	A0028022	MSH	
3	C0001403	A0019743	3	A1988358	PSY	member_of_cluster
4	C0001403	A2922421	1	A3307650	SNOMEDCT	isa
5	C0001403	A2922421	2	A3307650	SNOMEDCT	isa

	7 PTR	8 HCD	9 CVF
1	A0434168.A2367943.A2366890.A0135391.A0054194.A0020267.A0020270	C19.053.264.263	
2	A0434168.A2367943.A2366890.A0135391.A0072566.A0028022	C20.111.163	
3	A0449751.A1988279.A1988358		
4	A3684559.A3886745.A2880798.A3398606.A3399335.A3398961.A2872359. A2872360.A3307650		
5	A3684559.A3886745.A2880798.A3398606.A3399335.A3398961.A2872359. A2933400.A2989549.A3307650		

Appendix - Metathesaurus relational files (RRF) 167

MRREL (sample rows) (2004AB)

	1 CUI1	2 AUI1	3 STYPE1	4 REL	5 CUI2	AUI2	6 STYPE2
1	C0001403		CUI	RB	C0001621		CUI
2	C0001403	A0019738	AUI	SY	C0001403	A0049628	AUI
3	C0001403	A2922421	SCUI	CHD	C0085859	A2977940	SCUI
4	C0001403	A6326321	SCUI	RO	C0688490	A6339383	SCUI
5	C0001403	A0019743	AUI	PAR	C0935495	A1988358	AUI

	7 RELA	8 RUI	9 SRUI	10 SAB	11 SL	12 RG	13 DIR	14 SUPPRESS	15 CVF
1		R02837989		MTH			N	N	
2		R18849683		MSH	MSH			N	
3	isa	R19859511	1658795027	SNOMEDCT	SNOMEDCT	0	Y	N	
4	may_treat	R27600039		NDFRT	NDFRT			N	
5	has_member	R08110401		PSY	PSY			N	

Appendix - Metathesaurus relational files (RRF) 168

MRDEF (2004AB)

CUI	AUI	ATUI	SATUI	SAB	DEF	SUPPRESS	CVF
C0001403	A0019740	AT15061584		MSH	A disease characterized by hypotension, weight loss, anorexia, weakness, and sometimes a bronze-like melanotic hyperpigmentation of the skin. It is due to tuberculosis- or autoimmune-induced disease (hypofunction) of the adrenal glands that results in deficiency of aldosterone and cortisol. In the absence of replacement therapy, it is usually fatal.	N	

MRSAT (sample rows) (2004AB)

	1 CUI	2 LUI	3 SUI	4 METAUI	5 STYPE	CODE
1	C0001403	L0001403	S0010792	A0019738	AUI	D000224
2	C0001403	L0001403	S0010794	A6326321	SCUI	C712
3	C0001403	L0001403	S0354372	A2922421	SAUI	363732003
4	C0001403			R15742591	SRUI	
5	C0001403				CUI	

	7 ATUI	8 SATUI	9 ATN	10 SAB	11 ATV	14 SUPPRESS	15 CVF
1	AT15321482		DID	MSH	D000224	N	
2	AT33411754		MESH_UI	NDFRT	D000224	N	
3	AT24166602		DESCRIPTION STATUS	SNOMEDCT	0	N	
4	AT27438950		REFINABILITY	SNOMEDCT	0	N	
5	AT02925340		ST	MTH	R	N	

MRSTY (2004AB)

CUI	TUI	STN	STY	ATUI	CVF
C0001403	T047	B2.2.1.2.1	Disease or Syndrome	AT17683850	

Appendix - Metathesaurus relational files (RRF) 171

MRHIST (sample rows) (2004AB)

	1 CUI	2 SOURCEUI	3 SAB	4 SVER	5 CHANGETYPE
1	C0001403	1198962018	SNOMEDCT	20020731	0
2	C0001403	1212124016	SNOMEDCT	20020731	0
3	C0001403	1490869013	SNOMEDCT	20030131	0
4	C0001403	363732003	SNOMEDCT	20020129	0
5	C0001403	373662000	SNOMEDCT	20020731	0

	6 CHANGEKEY	7 CHANGEVAL	8 REASON	9 CVF
1	DESCRIPTIONSTATUS	0		
2	DESCRIPTIONSTATUS	0		
3	DESCRIPTIONSTATUS	0		
4	CONCEPTSTATUS	0		
5	CONCEPTSTATUS	0		

Appendix - Metathesaurus relational files (RRF) 172

Appendix 2

UMLS files in Original Release Format

MRCON Concepts (2003AA)

```
CUI      LAT TS  LUI    STT   SUI   STR             LRL
C0001403|ENG|P|L0001403|PF|S0010794|Addison's Disease|0|
C0001403|ENG|P|L0001403|VC|S0352253|ADDISON'S DISEASE|0|
C0001403|ENG|P|L0001403|VO|S0010792|Addison Disease|0|
C0001403|ENG|P|L0001403|VO|S0033587|Disease, Addison|0|
C0001403|ENG|P|L0001403|VO|S0469271|Addison's disease, NOS|3|
C0001403|ENG|S|L0278071|PF|S0352321|ADRENAL INSUFFICIENCY (ADDISON'S DISEASE)|0|
C0001403|ENG|S|L0278422|PF|S0352329|ADRENOCORTICAL INSUFFICIENCY, PRIMARY FAILURE|0|
C0001403|ENG|S|L0367999|PF|S0469267|Addison melanoderma|3|
C0001403|ENG|S|L0368000|PF|S0496840|Melasma addisonii|3|
C0001403|ENG|S|L0368398|PF|S0506528|Primary adrenal deficiency|3|
C0001403|ENG|S|L0373744|PF|S0471237|Asthenia pigmentosa|3|
C0001403|ENG|S|L0377831|PF|S0473611|Bronzed disease|3|
C0001403|ENG|S|L0494940|PF|S0718028|Primary adrenocortical insufficiency|3|
C0001403|ENG|s|L0494937|PF|S0718027|Primary adrenocortical insuff|3|
C0001403|FIN|P|L1510041|PF|S1805950|Addisonin tauti|3|
C0001403|FRE|S|L1272481|PF|S1514427|MALADIE D'ADDISON|2|
C0001403|GER|P|L1229627|PF|S1471573|Addison-Krankheit|3|
C0001403|GER|S|L1288823|PF|S1530769|Primaere Nebennierenrindeninsuffizienz|1|
C0001403|ITA|P|L1276837|PF|S1518783|Morbo di Addison|3|
C0001403|POR|P|L0324623|PF|S0432928|DOENCA DE ADDISON|2|
C0001403|RUS|P|L0889403|PF|S1093220|ADDISONOVA BOLEZN'|3|
C0001403|SPA|P|L0342625|PF|S0450930|ENFERMEDAD DE ADDISON|3|
[…]
```

Appendix - Metathesaurus relational files (ORF) 174

MRSO Sources (2003AA)

```
CUI      LUI      SUI      SAB TTY  SCD   SRL
C0001403|L0001403|S0010792|MSH|EN|D000224|0|
C0001403|L0001403|S0010794|MSH|MH|D000224|0|
C0001403|L0001403|S0010796|MSH|PM|D000224|0|
C0001403|L0001403|S0010796|PSY|PT|00810|3|
C0001403|L0001403|S0033587|MSH|PM|D000224|0|
C0001403|L0001403|S0220088|MSH|PM|D000224|0|
C0001403|L0001403|S0352252|CCPSS|PT|0022753|3|
C0001403|L0001403|S0352252|DXP|SY|NOCODE|0|
C0001403|L0001403|S0352253|CST|GT|ADREN INSUFFIC|0|
C0001403|L0001403|S0352253|WHO|IT|0410|2|
C0001403|L0001403|S0354372|AOD|DE|0000005430|0|
C0001403|L0001403|S0354372|CSP|PT|0060-3321|0|
C0001403|L0001403|S0354372|LCH|PT|U000061|0|
C0001403|L0001403|S0354372|MDR|LT|10001130|3|
C0001403|L0001403|S0354372|RCD|PT|C1541|3|
C0001403|L0001403|S0354372|SNM|SY|D-2332|3|
C0001403|L0001403|S0365923|CST|GT|ADREN INSUFFIC|0|
C0001403|L0001403|S0469271|SNMI|PT|DB-70620|3|
C0001403|L0001403|S1619433|MDR|LT|10001130|3|
C0001403|L0001403|S1911394|ICPC2P|PT|T99002|3|
C0001403|L0001403|S1921523|MTHICD9|ET|255.4|0|
C0001403|L0001403|S1932462|ICPC2P|SF|T99002|3|
[…]
```

MRDEF Definitions (2003AA)

```
CUI      SAB     DEF
C0001403|MSH|A disease characterized by hypotension, weight loss, anorexia,
weakness, and sometimes a bronze-like melanotic hyperpigmentation of the skin. It
is due to tuberculosis- or autoimmune-induced disease (hypofunction) of the
adrenal glands that results in deficiency of aldosterone and cortisol. In the
absence of replacement therapy, it is usually fatal.|
[…]
```

MRSTY Semantic Types (2003AA)

```
CUI      TUI  STY
C0001400|T040|Organism Function|
C0001403|T047|Disease or Syndrome|
C0001406|T083|Geographic Area|
C0001407|T114|Nucleic Acid, Nucleoside, or Nucleotide|
C0001407|T123|Biologically Active Substance|
[…]
```

MRATX Associated Expressions (2003AA)

```
CUI      SAB REL     ATX
 Closed fracture of malar and maxillary bones, NOS
C0009045|MSH|RB|<Zygomatic Fractures> OR <Maxillary Fractures>|

 Unilateral congenital dislocation of hip
C0009702|MSH|RB|<Hip Dislocation, Congenital> AND <Femur Head>/<abnormalities>|

 Suture of bladder
C0010700|MSH|RB|<Bladder>/<surgery>|

 Corneal abrasion
C0010032|MSH|RO|<Cornea>/<injuries>|

 CORRECTIVE LENS PROBLEM
C0010099|MSH|RO|<Contact Lenses>/<adverse effects>|

 Chronic cough
C0010201|MSH|SY|<Cough> AND <Chronic Disease>|

 Cyst and pseudocyst of pancreas
C0010623|MSH|SY|<Pancreatic Cyst> OR <Pancreatic Pseudocyst>|

 Cystitis
C0010692|LCH|RU|<Bladder>/<Inflammation>|
[…]
```

MRCXT Contexts (2003AA)

```
CUI      SUI      SAB  SCD    CXN CXL RNK   CXS             CUI2      HCD REL XC
C0001403|S0469271|SNMI|DB-70620|1|ANC|1|SNOMED International|C1140118||||
C0001403|S0469271|SNMI|DB-70620|1|ANC|2|DISEASES/DIAGNOSES|C0338067||||
C0001403|S0469271|SNMI|DB-70620|1|ANC|3|DISEASES OF THE END. SYSTEM|C0014130||||
C0001403|S0469271|SNMI|DB-70620|1|ANC|4|DISEASES OF THE ADRENAL GLANDS|C0001621||||
C0001403|S0469271|SNMI|DB-70620|1|CCP||Addison's disease, NOS|C0001403|DB-70620|||

(* = C0001403|S0718028|ICD10)
*|E27.1|1|ANC|1|ICD…, Tenth Revision (ICD-10)|C1140143||||
*|E27.1|1|ANC|2|Endocrine, nutritional and metabolic diseases|C0694452|E00-E90.9|||
*|E27.1|1|ANC|3|Disorders of other endocrine glands|C0178257|E20-E35.9|||
*|E27.1|1|ANC|4|Other disorders of adrenal gland|C0494313|E27|||
*|E27.1|1|CCP||Primary adrenocortical insufficiency|C0001403|E27.1|||

(* = C0001403|S0010794|MSH)
*|D000224|1|ANC|1|MeSH|C1135584||||
*|D000224|1|ANC|2|MeSH Descriptors|C1135587||||
*|D000224|1|ANC|3|Index Medicus Descriptor|C1135589||||
*|D000224|1|ANC|4|Diseases (MeSH Category)|C0012674|C|||
*|D000224|1|ANC|5|Endocrine Diseases|C0014130|C19|||
*|D000224|1|ANC|6|Adrenal Gland Diseases|C0001621|C19.53|||
*|D000224|1|ANC|7|Adrenal Gland Hypofunction|C0001623|C19.53.264|||
*|D000224|1|CCP||Addison's Disease|C0001403|C19.53.264.263|||
*|D000224|1|SIB||Adrenoleukodystrophy|C0001661|C19.53.264.270|||
*|D000224|1|SIB||Hypoaldosteronism|C0020595|C19.53.264.480|||
```

MRSAT Simple concept attributes (2003AA)

```
CUI      LUI      SUI      SCD    ATN SAB     ATV
C0001403|L0001403|S0010792|D000224|DID|MSH|D000224|
C0001403|L0001403|S0010792|D000224|EV|MSH|ADDISON DIS|
C0001403|L0001403|S0010792|D000224|MUI|MSH|M0000346|
C0001403|L0001403|S0010792|D000224|TH|MSH|UNK (19XX)|
C0001403|L0001403|S0010794|D000224|AN|MSH|an autoimmune dis with adrenal hypofunction|
C0001403|L0001403|S0010794|D000224|AQL|MSH|BL CF CI CL CN CO DH DI DT EC EH EM EN …|
C0001403|L0001403|S0010794|D000224|DC|MSH|1|
C0001403|L0001403|S0010794|D000224|DID|MSH|D000224|
C0001403|L0001403|S0010794|D000224|EV|MSH|ADDISON DIS|
C0001403|L0001403|S0010794|D000224|MDA|MSH|19990101|
C0001403|L0001403|S0010794|D000224|MED1963|NLM-MED|*2|
C0001403|L0001403|S0010794|D000224|MED1963|NLM-MED|2|
[…]
C0001403|L0001403|S0010794|D000224|MED2002|NLM-MED|*19|
C0001403|L0001403|S0010794|D000224|MED2002|NLM-MED|23|
[…]
C0001403|L0001403|S0010794|D000224|MN|MSH|C19.53.264.263|
C0001403|L0001403|S0010794|D000224|MN|MSH|C20.111.163|
[…]
C0001403|L0001403|S0469271|DB-70620|SIC|SNMI|255.4|
[…]
C0001403||||DA|MTH|19900930|
C0001403||||MR|MTH|20021026|
C0001403||||ST|MTH|R|
```

MRRANK Name Ranking (2003AA)

```
RANK SAB TTY SUPRES
0401|MTH|PN|N|
0400|MTH|MM|N|
0399|MSH|MH|N|
0398|MSH|TQ|N|
0397|MSH|EP|N|
0396|MSH|EN|N|
0395|MSH|XQ|N|
0394|MSH|NM|N|
0393|RXNORM|SCD|N|
0392|RXNORM|SCDC|N|
0391|DSM4|PT|N|
0390|DSM3R|PT|N|
0389|SNMI|PT|N|
0388|SNMI|PX|Y|
0387|SNMI|HT|N|
0386|SNMI|HX|Y|
0385|VANDF|CD|N|
0384|VANDF|HT|N|
0383|VANDF|IN|N|
0382|MDDB|CD|N|
0381|MMX|CD|N|
0380|MMX|IN|N|
0379|RCDSA|PT|N|
[…]
```

MRREL Inter-concept Relationships (2003AA)

```
CUI1    REL CUI2     RELA  SAB  SL      MG
C0001403|AQ|C0348026||MSH|MSH||
C0001403|CHD|C0342477||RCD|RCD||
C0001403|CHD|C0546992||RCD|RCD||
C0001403|PAR|C0001621||PSY|PSY||
C0001403|PAR|C0001621||SNMI|SNMI||
C0001403|PAR|C0001623||MSH|MSH||
C0001403|PAR|C0935495|has_member|PSY|PSY||
C0001403|RB|C0001621||PSY|PSY||
C0001403|RB|C0001623||MTH|MTH||
C0001403|RB|C0004364||CSP|CSP||
C0001403|RB|C0004364||MTH|MTH||
C0001403|RL|C0405580|mapped_from|SNMI|SNMI||
C0001403|RN|C0518933||MTH|MTH||
C0001403|RN|C0518934||MTH|MTH||
C0001403|RO|C0152889|associated_with|SNMI|SNMI||
C0001403|RO|C0546992||MTH|MTH||
C0001403|RQ|C0020615|clinically_associated_with|CCPSS|CCPSS||
C0001403|RQ|C0151467|clinically_similar|RAM|RAM||
C0001403|RQ|C0300942|classifies|MDR|MDR||
C0001403|RQ|C0405580|mapped_from|CST|CST||
C0001403|RQ|C0405580|mapped_to|HLREL|HLREL||
C0001403|RQ|C0740740|inverse_isa|CCPSS|CCPSS||
C0001403|SIB|C0001206||MDR|MDR||
[…]
```

MRCOC Co-occurrences (2003AA)

```
CUI1     CUI2   SOC COT COF COA
C0001403|C0000727|MED|L|1|CO=1,DI=1,ME=1|
C0001403|C0000737|MBD|L|1|CO=1,DI=1|
C0001403|C0000833|MED|L|2|MI=2,DT=1,RA=1|
C0001403|C0001175|MBD|L|1|CO=1|
C0001403|C0001418|MED|L|1|ET=1|
C0001403|C0001430|MBD|L|1|BL=1,CO=1|
C0001403|C0001551|MED|L|3|DT=3|
C0001403|C0001613|MBD|L|6|ET=2,IM=2,CL=1,CN=1,DI=1,PA=1,PP=1|
C0001403|C0001613|MED|L|6|IM=4,PP=3,CO=2,BL=1,DI=1,TH=1|
C0001403|C0001614|MBD|L|1|BL=1,CI=1|
C0001403|C0001617|MBD|L|1|BL=1|
C0001403|C0001618|MBD|L|2|BL=2,CO=1,ET=1|
C0001403|C0001618|MED|L|1|CO=1,PA=1|
[…]
C0018099|C0151373|AIR|KP|||
C0018099|C0151407|AIR|KP|||
C0018099|C0151463|CCPSS|PP|1||
C0018099|C0205082|CCPSS|MP|1||
C0018099|C0205090|CCPSS|MP|8||
C0018099|C0205091|CCPSS|MP|2||
C0018099|C0221598|AIR|KP|||
[…]
```

MRCON Suppressible synonyms (2003AA)

```
CUI      LAT TS  LUI    STT   SUI   STR              LRL
C0001403|ENG|P|L0001403|PF|S0010794|Addison's Disease|0|
C0001403|ENG|P|L0001403|VC|S0352253|ADDISON'S DISEASE|0|
C0001403|ENG|P|L0001403|VO|S0010792|Addison Disease|0|
C0001403|ENG|P|L0001403|VO|S0033587|Disease, Addison|0|
C0001403|ENG|P|L0001403|VO|S0469271|Addison's disease, NOS|3|
C0001403|ENG|S|L0278071|PF|S0352321|ADRENAL INSUFFICIENCY (ADDISON'S DISEASE)|0|
C0001403|ENG|S|L0278422|PF|S0352329|ADRENOCORTICAL INSUFFICIENCY, PRIMARY FAILURE|0|
C0001403|ENG|S|L0367999|PF|S0469267|Addison melanoderma|3|
C0001403|ENG|S|L0368000|PF|S0496840|Melasma addisonii|3|
C0001403|ENG|S|L0368398|PF|S0506528|Primary adrenal deficiency|3|
C0001403|ENG|S|L0373744|PF|S0471237|Asthenia pigmentosa|3|
C0001403|ENG|S|L0377831|PF|S0473611|Bronzed disease|3|
C0001403|ENG|S|L0494940|PF|S0718028|Primary adrenocortical insufficiency|3|
C0001403|ENG|S|L0494937|PF|S0718027|Primary adrenocortical insuff|3|
C0001403|FIN|P|L1510041|PF|S1805950|Addisonin tauti|3|
C0001403|FRE|S|L1272481|PF|S1514427|MALADIE D'ADDISON|2|
C0001403|GER|P|L1229627|PF|S1471573|Addison-Krankheit|3|
C0001403|GER|S|L1288823|PF|S1530769|Primaere Nebennierenrindeninsuffizienz|1|
C0001403|ITA|P|L1276837|PF|S1518783|Morbo di Addison|3|
C0001403|POR|P|L0324623|PF|S0432928|DOENCA DE ADDISON|2|
C0001403|RUS|P|L0889403|PF|S1093220|ADDISONOVA BOLEZN'|3|
C0001403|SPA|P|L0342625|PF|S0450930|ENFERMEDAD DE ADDISON|3|
[…]
```

MRCUI Concept history (2003AA)

```
CUI1     VER    CREL  CUI2  MAPIN
C0241779|1996AA|SY|C0001403|Y|
C0271735|1996AA|SY|C0001403|Y|
[…]
```

MRSAB Source information (2003AA)

```
VCUI     RCUI     VSAB    RSAB SON SF SVER MSTART MEND IMETA RMETA SLC SCC SRL TFR
C1140103|C1140104|INS2002|INS|French translation of the Medical Subject Headings,
2002|MSH|2002|2002_04_11||2002AB||Dr. Annie Advocat; e-mail: advocat@inserm-
dicdoc.u-strasbg.fr|Dr. Annie Advocat; e-mail: advocat@inserm-dicdoc.u-
strasbg.fr|3|30883|20692||MH,SY||FRE|ISO646-US|Y|Y|

C1140132|C1140133|BRMP2002|BRMP|Portuguese translation of the Medical Subject
Headings, 2002|MSH|2002|2001_12_04||2002AA||Elenice de Castro; e-mail:
elenice@brm.bireme.br|Elenice de Castro; e-mail:
elenice@brm.bireme.br|3|41853|27195||EP,MH,SY||POR|ISO646-US|Y|Y|

C1140297|C1140298|DUT2001|DUT|Dutch Translation of the Medical Subject Headings,
2001|MSH|2001|2001_12_04||2002AB||A.J.P.M.Overbeke, overbeke@ntvg.nl, * 20 662
0150|A.J.P.M.Overbeke, overbeke@ntvg.nl, * 20 662
0150|3|35705|17733||EP,MH,SY||DUT|ISO646-US|Y|Y|

C1142630|C1135584|MSH2003_2002_10_24|MSH|Medical Subject Headings,
2002_10_24|MSH|2003_2002_10_24|2002_11_05||2003AA||Stuart Nelson, M.D., Head, MeSH
Section; e-mail: nelson@nlm.nih.gov|Stuart Nelson, M.D., Head, MeSH Section; e-
mail: nelson@nlm.nih.gov|0|516015|231458|FULL-
MULTIPLE|CE,EN,EP,HS,HT,MH,N1,NM,PM,TQ,XQ|AN,AQL,CX,DC,DID,DQ,DS,DX,EC,EV,FR,FX,HM
,HN,II,LT,MDA,MMR,MN,MUI,OL,PA,PI,PM,QA,QE,QS,RN,RR,SOS,SRC,TH|ENG|ISO646-US|Y|Y|
```

SRDEF Basic information (2003AA)

```
RT  TUI  STY/RL  STN/RTN  DEF     EX     UN     NH     ABR     RIN
STY|T001|Organism|A1.1|Generally, a living individual, including all plants and
animals.|Homozygote; Radiation Chimera; Sporocyst|||||
STY|T002|Plant|A1.1.1|An organism having cellulose cell walls, growing by
synthesis of inorganic substances, generally distinguished by the presence of
chlorophyll, and lacking the power of locomotion.  Plant parts are included here
as well.|Pollen; Potatoes; Vegetables|||||
STY|T003|Alga|A1.1.1.1|A chiefly aquatic plant that contains chlorophyll, but does
not form embryos during development and lacks vascular tissue.|Chlorella;
Laminaria; Seaweed|||||
STY|T004|Fungus|A1.1.2|A eukaryotic organism characterized by the absence of
chlorophyll and the presence of a rigid cell wall.  Included here are both slime
molds and true fungi such as yeasts, molds, mildews, and mushrooms.|Aspergillus
clavatus; Blastomyces; Helminthosporium; Neurospora|||||
[…]
RL|T132|physically_related_to|R1|Related by virtue of some physical attribute or
characteristic.||||PR|physically_related_to|
RL|T133|part_of|R1.1|Composes, with one or more other physical units, some larger
whole.  This includes component of, division of, portion of, fragment of, section
of, and layer of.||||PT|has_part|
[…]
RL|T186|isa|H|The basic hierarchical link in the Network.  If one item "isa"
another item then the first item is more specific in meaning than the second
item.||||IS|inverse_isa|
[…]
```

SRSTR Structure (2003AA)

```
STY/RL              RL      STY/RL                                    LS
Biologic Function|affects|Organism|D|
Biologic Function|isa|Natural Phenomenon or Process|D|
Biologic Function|process_of|Organism|D|
Biologic Function|produces|Biologically Active Substance|D|
Biologic Function|produces|Body Substance|D|
[…]
Disease or Syndrome|conceptually_related_to|Experimental Model of Disease|DNI|
Disease or Syndrome|isa|Pathologic Function|D|
Disease or Syndrome|produces|Tissue|D|
[…]
Medical Device|isa|Manufactured Object|D|
Medical Device|prevents|Injury or Poisoning|D|
Medical Device|prevents|Pathologic Function|D|
Medical Device|treats|Anatomical Abnormality|D|
Medical Device|treats|Injury or Poisoning|D|
Medical Device|treats|Pathologic Function|D|
Medical Device|treats|Sign or Symptom|D|
[…]
Mental Process|process_of|Plant|B|  blocks  Biologic Function|process_of|Organism|D|
[…]
part_of|isa|physically_related_to|D|
[…]
```

SRSTRE2 Structure (expanded) (2003AA)

```
STY                RL          STY
Disease or Syndrome|isa|Pathologic Function|
Disease or Syndrome|isa|Biologic Function|
Disease or Syndrome|isa|Natural Phen. or Pr.|
Disease or Syndrome|isa|Phenomenon or Process|
Disease or Syndrome|isa|Event|
Disease or Syndrome|affects|Alga|
Disease or Syndrome|affects|Amphibian|
Disease or Syndrome|affects|Animal|
Disease or Syndrome|affects|Archaeon|
Disease or Syndrome|affects|Bacterium|
Disease or Syndrome|affects|Biologic Function|
Disease or Syndrome|affects|Bird|
Disease or Syndrome|affects|Cell Function|
Disease or Syndrome|affects|Cell or Molecular Dysfunction|
[…]
```

```
Pathologic Function |isa|Biologic Function|
Biologic Function|isa|Natural Phen. or Process|
Natural Phen. or Process|isa|Phen. or Process|
Phenomenon or Process|isa|Event|
```

from `Biologic Function|affects|Organism|D|`